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## Index Erasure Saps Our Case: Justice

WASHINGTON, D.C.—Late last week the Justice Department acknowledged that the destruction of the computerized index of documents as part of the IBM/ CDC settlement could seriously hamper the government's antitrust efforts against IBM.

In a brief filed last Wednesday in a federal appeals court in New York, the Justice Department contended that IBM had violated agreed rules in secretly negotiating to destroy the data and further, it said, this destruction was a deliberate attempt to hamper the government in its case.

The Justice brief stated that IBM did not inform the government of the destruction agreement with CDC in connection with the settlement.

CDC is expected to respond to the government's charges with the defense that the destruction of data was entirely proper and "involved laying down the weapons of war between Control Data and IBM."

IBM, in accordance with a pretrial order prohibiting comment on either side, was "unable to comment."

#### Application Filed For Arpa-Like Net

WASHINGTON, D.C. - The first application for a resource-sharing or "value-added" computer/communications network has been filed with the Federal Communications Commission by Packet Communications Inc. (PCI).

#### On the Inside This Week

IBM Sues Telex	
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# ★ The 360 Lives On ★

Don't scrap that 360 yet; there are ways to keep it going. See supplement following page 16.

By Ronald A. Frank

Of the CW Staff
TACOMA, Wash. – While most 360 upgrades involve the addition of online peripherals, some users find they can enhance the efficiency of their system with off-line equipment.

We had a purchased Model 30," said Ed Decker, director of data processing and finance for Day's Inc., a clothing

remote processing capability but we did not want to upgrade to a larger system," he said.

With a goal of minimizing the financial commitment, Decker wanted to get an "on-line, off-line system" that would be as close to being on-line as possible.

Day's acquired a terminal system configured with Datapoint 2200s which allows the firm's DP center to receive data on 9-track mag tape and transfer the reels onto the mainframe system tape drives for entry into the 360/30.

The terminals were part of a three-

pronged upgrade of the 30 that had some important benefits for Day's.

"My biggest problem was that our purchased Model 30 was worth \$150,000 while our books showed an amortized value of \$220,000," Decker said. His goal, with minimum capital outlay was to increase the value of the system and thereby bring the Model 30 closer to its book price.

"If we had upgraded to a larger mainframe we would have had a re-placement cost and also lost the amortization value," Decker ex-

"Our utilization of the 2200s has



The 3742 dual data station contains two keyboards, two diskette drives and a shared visual display unit

# **IBM Delivers 3740** Entry Unit to U.S.

By Michael Weinstein

Of the CW Staff
WHITE PLAINS, N.Y. – IBM's introduction of the 3740
Data Entry System into the U.S. is directed at users wishing to move data entry operations off-line and away from the central computing facility. The system was first introduced in Europe last September [CW, Oct. 4].

The basis of the system is the use of a floppy-disk storage media – called "diskettes" by IBM.

Sealed in a plastic jacket, each diskette is 8 inches in diameter – resembling a 45 rpm phono-

graph record - and weighs a little over

one ounce, a spokesman said. The storage capacity of each diskette is 242K characters, or 1,898 128-character

Industry reaction on page 21

data records - roughly the equivalent of 3,000 80-column punched cards, the spokesman maintained.

After data is recorded on a diskette, the plastic jacket can be sealed and recorded data mailed to a central data processing

facility, the spokesman said.

The difficulty in comparing the IBM 3740 to other available key-to-disk data entry systems is that presently there are no figures for average user throughput keystroke/hr.

While these figures are not available, the (Continued on Page 2)

# Mini-Based Fortran Steals Job From 370

By Don Leavitt

Of the CW Staff
SOUTHBORO, Mass. – A Fortran program took only 16% longer to run on a Nova 800 mini than on a 370/145 mainframe in a recent user-controlled benchmark of the newly announced Fortran 5 compiler from Data General.

Fortran 5 is a superset of Fortran IV and is compatible with ANS Fortran, IBM's Level H Fortran and Univac's Fortran V. It includes several language extensions and an object-code optimization process that is said to cut run times dramatically

#### **4 Vendors Selected**

For his benchmarking, the user selected part of a large application and input the same source code to the IBM, and Data General compilers, as well as those of two other vendors. The test program was typical of the entire application, he said, but was the most time-consuming part of the operation.

The user preferred anonymity in order to maintain a "competitive edge" in his industry.

The application handled production planning and estimination has been described by the production planning and estimination has been described by the production planning and estimination has been described by the production planning and estimate the production planning as the production planning and planting and planting and planting and planting as the production planting and planti

edge" in his industry.

The application handled production planning and optimization but the test portion involved only normal integer arithmetic. The floating-point capabilities of Fortran 5 were not tested.

The user had previously compiled the test program under Data General's Fortran IV and execution time then was 15 times as long

on the Nova 800 as on the 145.

#### **User Convinced**

The Fortran 5 test results were dramatic enough so that the user now plans to move the entire application, including data communications support, from the 145 to the mini.

(Continued on Page 2)

# Analysis: IBM/CDC Why Was Index Destroyed?

Of the CW Staff
MINNEAPOLIS — "IBM must have had something to hide."

That is the reaction of one person close to the antitrust actions against IBM on learning last week that an important computerized index of the documents in the Control Data/IBM case had been destroyed as part of the settlement agreement between the two.

And he was not the only one upset over the destruction of the index. Industry leaders and users both cried "foul," one industry organization called for a grand

jury investigation of the incident and several people indicated the move might delay the government's case against IBM.

In addition, Telex filed suit in Federal District Court here asking that the entire settlement be overturned, claiming the records destroyed were supposed to have been made available to Telex for its suit against IBM [CW, Jan 24].

#### How Did It Happen?

None of the actual 40 million documents filed in the case was destroyed as part of the bargain, but the index that helped identify specific documents was (Continued on Page 4)

#### **Delivers 3740 Entry** Unit in

other side of the trade-off is known - the cost of each keystation.

Compared to the earlier buffered IBM 129 Model 3, the 3741 key-to-floppy-disk keystation rents for \$159/mo and the 129 rents for \$150/mo.

Compared with other vendor units which use a shared processor to support satellite stations, the IBM 3741 is almost double the cost per entry station.

Of course, users must add the cost of the shared processor to the cost of other vendor systems; but even with this addi-

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POSTMASTER: Send Form 3579 (Change of Address) to Computerworld Circulation Dept., 797 Washington St., Newton, Mass. 02160. tion it appears that the IBM system using more than 10 stations costs more than an independent system.

example, a system consisting of 10 IBM 3741s - each with one diskette drive and no communications capabilities - rents for \$1,590/mo on a month-bymonth contract.

A 10-keystation system from another typical vendor with shared processor—including communications and converter - rents for around \$1,160/mo.

To support the user choosing the IBM key-to-diskette data entry approach, IBM announced the availability to domestic users of two data entry stations, a data

	1-mo rental	2-yr rental	purchase
3741 (1)*	\$159	\$135	\$6,000
(2)**	224	190	8,430
BSCA***	194	165	7,250 6,950
3747	465	395	19,560
3540 (1)	535	455	22,000
(2)	805	685	33,550
3713	159	135	5,400

Diskettes cost \$40 for a quantity of five.

\* with one diskette drive

\*\* with two diskette drives

\*\*\* with communications capability

Prices for Equipment in the 3740 Data **Entry System** 

converter, a printer and an I/O unit - for direct transfer of data to and from larger remote processors.

The 3741 data station is designed primarily for stand-alone use, he noted.

The unit is composed of a micropro

grammed control unit which contains all the logic for editing and inputting data, a typewriter-like keyboard, one or two diskette drives and a 240-character visual display in a format of 40-character lines.

#### Station-to-Station

When equipped with a binary synchronous communications adapter (BSCA), the 3741 can communicate with another 3741 having the BSCA, as well as specially equipped models of IBM 360 and 370 processors, he added.

The data station can also communicate with the 3747 data converter – another component of the 3740 Data Entry System - and can be directly attached to both models of the System/3 disk system via the local communications adapter.

The 3742 dual data station is essentially two single 3741 data stations grouped together with the option of permitting data to be copied from one operator's diskette drive to the other while records

are merged into a single diskette.

The unit incorporates a visual display, designed with mirror optics, permitting half the display - containing 120 characters in three lines - to be visible to each operator, for editing and formatting.

The 3747 data converter is a standalone, off-line device for converting data from diskettes to standard 1/2-in. mag-

netic tape.

The 3747 can also be equipped with a BSCA allowing communications with other data stations or IBM 360 and 370 processors.

The 3713 printer is a 40 char./sec natrix optional printer which attaches to the 3741 data station.



To record data, the operator drops a diskette into the slot and begins keying.

Printouts can be produced from data recorded on diskettes as well as informa-tion transmitted to the data station with BSCA from a central computer.
The 3540, a systems I/O device, com-

municates directly to IBM 370 models, by selector channel, byte-multiplexer channel or block-multiplexer channel.

The unit can read up to 3,600 diskette

record/min into the processor and can write up to 2,200 record/min from the computer onto diskettes.

## Mini-Based Fortran Steals Job

(Continued from Page 1)

Fortran 5 runs under the Real Time DOS and uses a new floating-point processor that can be added to any Nova-line with room for an extra circuit board. Average add time is less than 8  $\mu$ sec, the company noted.

The compiler uses a global approach to optimization, reading in the entire original object code and plotting complete tree structure of its logic before making any modifications. This is the first global optimizer on a mini, Data General said.

Fortran 5 language and processor extensions include multitasking, with 256 possible priority levels; optimized DO loops; and reentrant code that allows many users to share a single copy of a program. It also supports fully recursive routines and in-line subscript handling, the company noted.

A full battery of English language diagnostics is included for fast, easy debugging. Fortran 5 can use the flexible file system and foreground/background features of the Real Time DOS.

A minimum Fortran 5 system includes a mini with 28K of core memory, 512K words of disk storage, the floating-point processor, hardware multiply/divide, a magnetic tape transport and a console terminal. Configured around a Nova 800 jumbo, the system costs approximately \$48,000. A Nova 1200 would drop the cost to about \$42,000, Data General said.

The floating-point processor board is available separately for \$4,000.

#### Name That Hit Tune! **But Computer Can't**

HOLLYWOOD, Calif. - Computers can create music, but they cannot determine what makes a hit record, according to Allen D. Allen.

Allen, a composer and a research scientist, worked extensively with computers trying to find technical parallels among hit songs.

"Initially I tried to find a correlation between melodies I like," Allen said. "I took all the tunes — the chord struc-

tures, tendency toward intervals, surprise, tempo, time signatures and all the other elements. There was absolutely no correlation between the songs I like. So I thought that may be I'm weird.

"Then we did a study with an IBM 1130 computer. This was to find what hit records had in common. We used all the same factors (as for tunes) plus tone colors, instrumentations, lyrics, bottom or high end, etc. We could find absolutely no mathematical formula for a pleasing melody or a big-selling disk."

#### House Says 'Aye' to Vote System

WASHINGTON, D.C. - The House of Representatives' electronic roll call system passed its first test last week - but it was only on a quorum call. Officials said the system worked very well but no actual voting on a bill is expected for several weeks.

Under the new system developed by

Control Data, House members insert plas-tic identification cards in one of 44 voting stations scattered around the House chamber. Votes are channeled into a computer which produces a visual display of the vote for verification and produces a hard copy of the outcome of the vote.

Rep. Wayne L. Hays (D-Ohio), chairman of the administration committee, said the system cost \$1.06 million but said the time saved would take care of the cost in one year.

The traditional hand-tallied roll calls take about 25 minutes just to call the roll, but the automated system will take only 15 minutes for a full House vote.

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# Study Finds 40 Susceptible 360/30 Price Drop Seen

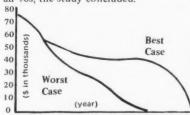
By a CW Staff Writer
ELMSFORD, N.Y. — A 10-year pricelevel forecast of IBM 360/30s and 40s by
Time Brokers, Inc. suggests that the Model 30 will slowly decline in price while keeping utility value and the 360/40 will be vulnerable to new IBM announcements which may affect its marketability in the 1976-77 markets.

During the last quarter of 1972, 360/30 sales were brisk, with demand slightly stronger than supply, the study stated.

#### 30s Popular

This was most marked by an increase in the demand for smaller Model 30s. The study attributes the demand to users' acceptance of add-on memory — "a buyer will purchase a used 16K-byte machine, "a buver add 49K bytes of add-on and have a low-priced 65K-byte machine."

Presently many owners of 360/40s are reluctant to sell what they know is a "very solid system in terms of utility" for less than their idea of current market value, and thus, sales have been slow for all 40s, the study concluded.



70 71 72 73 74 75 76 77 78 79 80 81 82 83

Forecast of 360/40 Price Levels Expressed as a Percentage of List Price – 1973 to

Those sales taking place are reported to be 5% lower than prices during the sum-

#### VS Upset Market

Model 50s and 65s have not fared well in the current market, the study maintained. "While there have been flurries of interest . . . . the big systems market has been upset by the introduction of virtual

Many large system users are reportedly standing pat until they decide the best

Another point of interest is the appearance of the IBM 370/145 on the used computer market. Prices are listed at about 85% of list when a user sells, and

are leased to save money.

CSA leases provide long term economy, while customers enjoy the flexibility of upgrading and early termination

#### **Computer Systems 90** of America, inc.

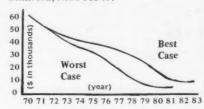
Send for the 12 questions you should ask of any leasing company before you lease



about 89% when a user buys

This market is expected to intensify i.e., the number of 370s offered will increase – but the price will remain fairly level for most of 1973, the study fore-

A copy of the Blue Book of Used Computer Prices is free upon request from Time Brokers, Inc., 500 Executive Blvd., Elmsford, N.Y. 10549.



Forecast of 360/30 Price Levels Expressed as a Percentage of List Price – 1973 to

#### City Cleared After DP Misuse Charge

HONOLULU - Although Larry E. Stevens, who accused the mayor here of illegally using city computer services to promote his successful bid for reelection, is still missing since Octo-ber [CW, Dec. 20], city investigators are certain his claims were fabricated.

Only two mysteries remain – where is Stevens, and why did he say what he

Stevens claimed that between "\$50,000 and \$100,000 of taxpayers" money" in city computer services were used for Mayor Frank F. Fasi's reelection bid.

Shortly after his October charge, police reported the Stevens car had been found at Honolulu International Airport with \$75 in the glove compart-

The widely publicized preelection allegations were investigated by the City Council which investigated many complaints of Fasi's alleged misuse of city employees and resources.

The city Department of Information Systems, which Stevens said illegally merged voter registration tape files and Hawaiian Telephone Co. tape files of telephone numbers and addresses for the Fasi campaign, came out of the City Council's hearings with a clean bill of health.

Gerald L. Mann Jr., director of the Department of Information Systems, told Computerworld that "if anybody looks at Stevens' figures, they look ridiculous. There's no truth in it."

Stevens, he said, had formerly been an analyst with the department, but hadn't worked there for "two and a half years prior to his announcement department. He couldn't have seen what he said he saw.

"I only wish," Mann said, "he would return to clear up the mystery.

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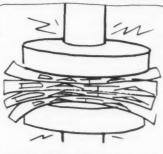




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# hy Was Index Erased? What Effect Will This Have?

(Continued from Page 1) erased, sources indicated last week.

Reportedly, the IBM and CDC

board of directors met on Fri-day, Jan. 12 and approved settlement terms.

The lawyers for the two firms met the next day, in order to sign the settlement documents, but someone, apparently the IBM legal team, balked until the disk packs with the index/access method to the microfilmed documents were erased and de-

The agreement was then

Both IBM and CDC argue that the destruction of the records was customary procedure. Generally when cases are settled out of court, the "work product" of the lawyers is destroyed, they claimed.

In most cases this consists of tentative trial plans, notes made in court, miscellaneous doo-dlings, etc. However, in this case the argument was used to cover the computer-based index to the documents filed in the case.

Without the index and access method, sources said, the documents could be almost meaning-

And, Telex argued, not only did the destruction of the index make the document collection meaningless, but it was also in direct violation of a court order.

The order issued last July by udge Philip Neville stated: "It is Judge Philip Neville stated: further ordered that Control statement of willingness to do so, will make available to the counsel for Telex all IBM documents in its possession and its so-called data base or index."

The Telex motion to overturn the IBM/CDC settlement on these grounds was set for hearing late last week.

In addition to the Telex action efore the court, the Association of Data Processing Service Organizations (Adapso) last week called on the Justice Department to convene a grand jury to investigate whether the IBM/CDC deal did in fact violate the law.

In a letter to Attorney General Richard Kleindienst, the group indicated that "the destruction of materials... would have the effect of delaying the govern-ment's antitrust litigation against IBM for a substantial period of time.

addition, Adapso said: 'There seems no apparent purpose to this surreptitious, clandestine action except to preclude our government and others from asserting rights to such materials."

Adapso also noted that "depending upon the precise nature of the conduct involved and the accompanying intent, such con-

criminal law, a contempt of existing court orders, and to the extent that attorneys participated, a breach of the disciplinary rules governing the professional conduct of counsel.

"We request that you exercise your power and responsibility as attorney general of the U.S., to conduct a grand jury investiga-tion into this matter so that appropriate remedial action may be taken," the letter concluded.

## Analysis

It is hard at this time to assess the overall effect of the destruction of the index to the documents, according to sources.

It is known that Telex maintains its own index for the documents that it plans to use in its case against IBM, scheduled to start in April.

Sources close to Telex, howbeen some documents it had overlooked in preparation for the case and that it would now be much harder to find them if needed.

"Without the Control Data index to the documents, it might take years to find a specific lions of papers filed with Control Data," a source said.

"There must have been something to hide or else they would not have been so concerned that the index be destroyed.

"Maybe there were some par-ticularly damaging documents that Telex has missed. Now it will never be able to find them without access to the index.'

At the same time, Telex officials indicated they were pre-pared to go ahead with their case and said they felt they had enough evidence to win.

The Justice Department has remained mum on the entire settlement agreement, but sources close to the department indiit is maintaining its own index to the documents in the case.

"But their index is nowhere as complete and comprehensive the one maintained by Control Data," a legal source in Washington said.

At the same time, he indicated the destruction of the index should not slow the department down greatly, even though it would have to add additional manpower to the case if it wanted to proceed as fast as the help of CDC.

Control Data President William Norris defended his company's

actions.
In a letter to shareholders, employees and the press, Norris said: "In the first place, we were not forced to do anything. It is my firm judgment that disposing of the work product of our at-torneys, developed at our sole expense (many millions of dol-lars) for use by us in our case, was the proper thing to do and was consistent with legal prac-

"Furthermore, having settled the litigation, it was proper and customary that our attorneys' work would not be made available to other plaintiffs, present or future. These are materials that no other party has any right

to.
"I should emphasize that Control Data has been trying its own case, not the government's.
While we have fully cooperated with all government requests for material from our data base. there has never been any under-standing that our effort would continue after a settlement. The government's 25-man staff, headed by two distinguished trial lawyers, is fully capable of trying its own lawsuit.

#### With Age Like Fine Wine, His 30 **Improves**

(Continued from Page 1) added years of life to our present installation," Decker said.

"Without the 2200, we would have had to go to a larger system, probably a 370/135 and compatible remote job entry terminals, at a much greater cost and, we think, with less efficiency than with the leased 2200s."

In addition to the terminals, Day's increased the CPU memory with the addition of 32K from Cambridge Memories. The firm also replaced three IBM 2311 drives with three Potter double-density drives. 4314 "This allowed us to put our customer account master file on line, Decker said.

#### Ratio Looks Better

Now the "balance between the book value and the market value" of the Model 30 "is much closer," he said. Decker estimates the market value now is about \$225,000 while the book value is about \$250,000. But the ratio looks better than before the upgrade, he said.

When we bought the Model 30, IBM recommended that we amortize the system over a cer-tain period of time. They showed us the payback using one of their famous charts, Decker said.

The system was amortized over a nine-year period, and when IBM announced the 370, the 360 was devalued, and its market price dropped, he said.

Decker determined the price of his 360 by putting out bids and investigating the possibility of upgrading to a 360/40. Based on responses from potential purchasers of his Model 30, Decker arrived at an average market price for the system.

While he elected to keep the Model 30, he did sell three of his initial six IBM 2311s and re-placed them with the Potter

The key to increasing the value of his system was the use of non-IBM equipment, Decker

#### Bonus for User

"We purchased the Potter drives for \$40,000 while IBM wanted \$96,000 for a three-stack 2314 system," he said. As an additional bonus, the Potter double-density drives have a greater capacity than the more expensive IBM units, he added. The 32K of core from Cambridge resulted in a savings of \$40,000, Decker said. "We \$40,000, Decker said.

would have paid over \$50,000 for 32K of core from IBM but the Cambridge box cost only \$17,000." Even IBM "second-hand core" would have cost would have cost about \$29,000, he added.

With the 64K on the Model 30 company has gone to a multipartition operating environment. "We wrote our own spooler which allowed us to get more time on the computer compared with IBM's Power, or the Grasp package from Software Design Inc.," he said.

Power allowed 16% "more time on the CPU" while Grasp

increased efficiency about 18%

The in-house spooler, called Intercept, increased efficiency by 28%, according to Decker.

"We use our package to spool and we handle I/O in one partition and our regular processing on the other to get a much better utilization of the CPU."

#### Two Surfaces

Both Power and Grasp require dedicated 2311 while the inhouse software uses only two disk surfaces.

The in-house package developed by the firm's four-man programming staff has allowed Day's to go from a three-shift to a two-shift operation. The extra time on the 360 is used for "specialized management reporting," Decker said.
"Our in-house programming.

staff also created all the neces sary programs for the terminal system in Databus, the Cobollike processing language made available with the 2220," noted "We can make Decker. change or alterations required in

## Quake Data Missing Because of Man

LA JOLLA, Calif. - The use of computer technology in earthquake prediction appears to be way ahead of man's ability to provide the computer meaningful physical data.

A computer model describing he way rock formations dilate under stress, used in conjunction with laboratory observations of rock deformation, could provide "the place, time and even magnitude of an impending earth-quake," according to J.T. Cherry, developer of the model and principal investigator in the geophysics and materials depart-ment at Systems, Science and Software Inc.

#### Digging Deep

However, "what is really needed," he said, "are methods for obtaining strain information well below the earth's surface. where the rock is firmly anchored and not moving."

No successful method for accomplishing that has been demonstrated, Cherry said, but meaningful data may be obtained from a technique which involves measuring the changes in the speed of sound at depths a few kilometers below the sur-

That data recorded over period of years and analyzed with the computer "dilatancy model" could provide the first predictions of time, place and magnitude of future earthquakes, Cherry believes.

#### Camel Driver Finds Happiness in DP

ABU DHABI, the Trucial States - Once upon a time the tiny shiekdom of Abu Dhabi, there lived a man named Ahab.

Ahab was a camel driver and most of his friends were either fishermen or pearl divers. Life was simple.

soon oil was discovered and the magic black liquid brought many changes to the 50,000 inhabitants of Abu Dhabi and their neighbors along the Persian Gulf. Progress and development came in with a rush and, alas for Ahab, cars replaced camels.

The outlook for Ahab was bleak and the leaders of Abu Dhabi had trouble keeping track of their new-found wealth (\$378 million/yr from oil alone).

But from across the waters NCR appeared with a small 500 computer. The magic machine paid the workers and kept track of the inhabitants and their money.

Since then, Abu Dhabi and neighboring sheikdoms shed their status as British Protectorates and formed the Federation of United Arab Emirates. And the leaders have acquired an even bigger machine, a Century 200, so Abu Dhabi will be able to assist its neighbors.

Life has improved for Ahab, too. He has given up camel driving and learned to operate the magic machine and so far is living happily ever after.



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# News Wrapup

#### County Hiring Biased, DPers Say

PRINCE GEORGES COUNTY, Md. — Two systems analysts in the county's data processing division have charged that the county denied them promotions and discriminated against them because they are not "retired military personnel."

In a series of hearings, Fern Lanthier and Michael Nugent claimed that eight of the 11 management positions in data processing were held by former Air Force personnel and that 10 of the county's 22 systems analysts are also former service people.

Lanthier and Nugent charged there is a "buddy system" among retired military personnel to keep civilians from being hired or promoted. They said retiring sergeants at nearby Bolling and

promoted. They said retiring sergeants at nearby Bolling and Andrews Air Force bases are notified in advance of available positions.

A ruling on the charge is expected soon from the county personnel

#### Computer Spots a Hot Ticket at Races

SCHENECTADY, N.Y. – A computer has outwitted one man's attempt to beat the odds at the race track.

On Dec. 19, an unidentified man presented to the Schenectady off-track betting operation a ticket that read, "Monticello, Dec. 11, W-8-B-2." This identified a \$2 win bet on a horse lettered "B" in the eighth race — in this case worth \$73.

The ticket, however, also bore a computer-generated 15-digit alphanumeric identifier, which is used to check every winning ticket

before payment is made.

When the computer terminal indicated the ticket was not a winner, the man argued the point briefly, then left his name (later found to

be fictitious) and went away.

OTB officials, after lengthy examination of the ticket, established that the "W-8-B-2" had been peeled from the surface of another

#### ticket and carefully pasted in place. New Grading Set for Bar Exam Questions

SPOKANE, Wash. - Computer-graded, multiple-choice questions will constitute one day of the three-day Washington State bar examination starting Feb. 26, the State Bar Association's board of governors said.

The one-day computerized test is reportedly the culmination of many years of experiment and research by national bar examination experts and the Educational Testing Service of New Jersey.

The multistate bar examination is given on the same day in all

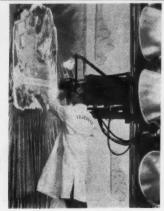
#### Life Not Quite Over for Life Magazine

NEW YORK, N.Y. — Life may end but the computer goes on. On Dec. 8, the directors of Time, Inc. announced the end of *Life* Magazine. On Dec. 20, Philip Dorf of Manhattan received a computerized "Dear Subscriber" letter saying that even though he is "a regular subscriber and friend" of *Life*, "we now have to drop your name from our weekly delivery rolls." name from our weekly delivery rolls.

Since we haven't received any renewal instructions from you," it

continued, "we've had to stop sending you Life.







#### Flying...but Not Off the Ground

At Lockheed-Georgia Co. a computer-controlled flight simulator is used to train pilots to fly C-5 Galaxy airplanes. An "in motion" cockpit and televised terrain are linked by a Lockheed Electronics MAC 16 minicomputer. Movement of simulator controls by the pilot (left) causes the television camera (middle) to display model terrain on an aircraft windscreen. Pilots

"fly" across landscape creating aircraft movements similar to those experienced in normal flights. Here the camera is focused on an island airfield. Material surrounding the island undulates with illumination from a large bank of lights to produce water movement. Flight equations of motion are put into the minicomputer (right) prior to simulated runs.

# Paranoid Programmers, You're Really OK

By Michael Weinstein

Of the CW Staff

"The average programmer is excessively independent excessively independent – some-times to the point of mild para-noia. He is often egocentric, slightly neurotic, and he borders on a limited schizophrenia," cording to Dick Brandon at the 1968 ACM Conference.

Programmers and managers were disturbed by Brandon's analysis and sought therapy as a result are advised to take heart since new data has been compiled that suggests that while some DPers may be paranoid or schizoid, the large majority is not.

#### Personality Profile

One test result cited by T.C. Willoughby of Penn State University is the Edward Personal Preference Schedule (EPPS) used by computer personnel researchers to measure personality variables or personal preference

Results of this test indicated that good systems analysts and programmers tended not to need help from others, were insus-ceptible to opinions of others, liked things orderly, liked to see milestones tick off rapidly, liked to be the dominant person in a situation and did not like to be overruled.

While the EPPS results do not describe the average person, neither do they indicate evidence of the abnormal qualities described by Brandon, Willoughby noted.

Another study the programmer can cite when trying to get a refund from his analyst contrasts interest areas of programmers with the level of psychopathic deviation expected in these

Programmers were found in the upper third of scientific, computational, mechanical and musical interests.

Since people with high scientific interests tend not to be paranoid, it follows that pro-grammers should not as a rule be paranoid, Willoughby stressed.

The same lack of paranoia is found in persons with a high interest in computational and mechanical interests, Willoughby added.

Detracting from the program-mer sanity theory is the fact that persons with a high interest in music are more prone to schizophrenia.

To counteract arguments based on the music-schizophrenia correlation, Willoughby pointed out that if programmers really were schizophrenic, they would also rank high in clerical interests since persons with such interests tend toward schizophrenia.

Tests show that programmers in fact rank very low in clerical interests – an insight that will not surprise those who have tried to get a programmer to document his work.

In explaining how the profes-sion received this somewhat tarnished image, Willoughby pointed to the age difference between programmers and super-visors and suggested that supervisors have an "aggressive in-dividualistic" nature of existence while the programmer may be a "pacifistic individual."

The evident frustration with the programmer could be due to the different value systems, not the supposed psychological aberrations of the individual. Willoughby stated.

A full report of Willoughby's

study can be found in the pro-ceedings of the tenth annual Computer Research Conference, available from the Association for Computing Machinery, 1133 Avenue of the Americas, New York, N.Y. 10036.

The Computer Installation Management System (CIMS) provides a method to supply management with pertinent information in the Itilization of their data processing hardware. CIMS accepts data collected by the System Management Facility (SMF), formats the data and presents the data in varying sequences and formats. Reports for job accounting, multiprogramming throughput, hardware analysis, and others are provided.

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# "We're introducing a major new version of the DP-AUDITO system at the computer



caravan and we'd like to give you a preview."

John Cullinane

"Version III of the EDP-AUDITOR/CULPRIT systems has a great group of new features, including important enhancements to the

Data Base Management versions.

If you are a current user, you will naturally get Version III free. This includes those many customers who installed these systems during the past year.

Since most users performed a competitive analysis of all competing products before choosing an EDP-AUDITOR or CULPRIT system (in many cases with the assistance of outside consultants) it will be obvious that we haven't added features

merely to win a competitive analysis. That wouldn't be necessary.

Our aim was, quite simply, to give you a tool that really produces results in your installation. As you know, there's a difference. In fact, most of these new enhancements grew directly out of dayby-day contact with user groups.

We hope to see you at a Cullinane seminar to be held in conjunction with the computer caravan. We'd like you to meet our key staff members, such as Jim Baker, Ken Falor, Tom Meurer or Jerry Miller and question them directly about new Version III.

In the meantime, we'd like to ask you to read the following

long (but important) list of new EDP-AUDITOR/CULPRIT features."

#### **CULPRIT III**

- ☐ Special forms facility allows indi-
- Special roms lacing allows individual handling for each report calling for special forms.

   Input record size can now be up to 8,192 bytes long.

   Procedure buffer size has been doubled in size allowing more procedure parameters to handle very complex reports.
- very complex reports.

  Well organized and easy to read
- input parameter listing

  Table look up.

#### SPECIAL CULPRIT MODULES

- Parameterized file matching (user specifies size and location of keys at run time).
  Index sequential random read routine.
- routine.

  ☐ IBM-DDA file match and expansion modules which are valuable to banks using IBM's Demand Deposit Accounting System.

- Redefinition of output lines to allow greater output format flexibility.

  8-character field names for
- improved data dictionary
- mnemonics.

  New "0" Parameter greatly simplifies certain calculations at total time related to values accumulated at input time.

  All Assembly Language coding eliminates COBOL modules and reduces core requirements by 3K.

- for reading GE 400 tapes directly on IBM computer.

  RCA 301 Series tape read module for reading RCA 301 tapes directly on IBM computer.

  VISAM file read module.

  Label output module which produces 2, 3, 4, 5-up labels simply.

  Splitter output module permits

- Occurs repeating segment module which handles Occurs or Occurs Depending On segment types.
   GE 400 Series tape read module
- the specification and printing of any number of lines from a singl record.
- ☐ Bit-testing module.

#### **DATA BASE MANAGEMENT VERSIONS**

#### IMS/CULPRIT

- User may provide SSA's to allow selected segment retrieval or to access segments randomly.

  8,192 byte segments or segment strings allowed.

  Access two or more IMS files at the same time.

  Access non-IMS files during an

#### RDMS/CULPRIT

- RDMS/CULPRIT

  Information available from the Control, DATA, and XREF portions of RDAM records.

  Automatic expansion of compressed format data fields to any size desired by the user.

  Employs cataloguing feature eliminating need to define logical fields in report parameter cards.

  Processes a virtually unlimited number of strings through the data base.
- data base.

  Reads initial driving file in a string

#### TOTAL/CULPRIT

- ☐ Information available from the entire TOTAL record including root and linkage segments.
  ☐ Employs a cataloguing feature eliminating the need to define logical fields in report parameter cards.
- cards.

  Processes a virtually unlimited number of strings through the data base. Each string may be several files long.

  Reads initial driving file in a string either directly or sequentially. All other reads are direct.

- IMS run.
  Access HDAM, HIDAM, HISAM files, physical or logical.
  Enhanced data dictionary capability.
  Also includes all features listed above under CULPRIT.
- either directly or sequentially. All other reads are direct.

  Direct reads can be based on keys submitted by user and/or keys read from a non-RDMS file.

  Chaining across files through XREF entries handled automatically by the system.

  Handles single file record cross referencing techniques (e.g., Bill of Materials organization).

  Includes all features listed under CULPRIT sections.

- □ Direct reads can be based on keys submitted by users and/or keys read from a non-TOTAL file.
   □ Linking between files and reading of variable chains handled automatically by the system.
   □ Handles multiple linkages between a master and/or variable file (e.g., Bill of Materials organization).
   □ Access all types of files.
   □ Includes all features listed under CULPRIT section.

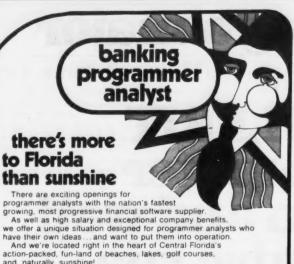
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#### Computers and the DP Employee - Part II

# Trainees? There's No Shortage in the UK

By Joseph Hanlon

Special to Computerworld
LONDON - DP employees are identifying more with DP than with their firms and are finding their career prospects primarily within DP. Thus the chances of moving out of DP into company management are diminishing.

These conclusions come from a report entitled "Computers in Offices," released by the UK Department of Employment. It is based on informa-tion from 86% of British office computer users.

According to the report, the spectacular demand for DP staff that characterized the computer boom will never return, despite the end of the recession. There is still a shortage of trained staff and it will

get worse, but there is no shortage of trainees.

In the typical user installation, the staff ratio for each DP manager (or assistant) is 3-1/2 systems analysts, five programmers, four computer

operators and 11 data preparation employees.

In service bureaus, software houses and manufacturers' customer service departments, the proportion of programmers and analysts is consame for the rest of the decade, the report said, except for data preparation staff which will slowly

The growth of DP office jobs will be a steady 17,000/yr, including 1,000 additional DP managers, 8,000 programmers and analysts and 4,000 operators.

Data preparation personnel now outnumber DP managers, systems analysts and programmers combined, but because of key-to-tape, key-to-disk and OCR, the number of data preparation employees will increase only by 2,000/yr, the report pre-

#### Staving in DP

The internal growth of DP jobs will be the main opportunity for advancement, the report said. There will be a 60% increase in DP jobs at all levels in the next six years, and most of these jobs will be filled either by promoting people already in DP or by moving up staff now in the firm but not yet

On the other hand, the chance of moving up and out of DP is shrinking: two-thirds of all DP installations reported that DP staff had either a "poor chance" or "no chance" for career opportunities outside DP.

One reason cited by the report for the lack of people moving into management is that DP salaries are still relatively higher than those in the rest of the company. "To be moved from DP to an executive post outside, an individual might need the equivalent of two promotions to retain his current salary scale, the report declared.

#### Source of Staff

The report also discussed the source of new DP employees

Of newly appointed DP managers, 28% moved up to the job from within the firm's own DP department and 29% came from elsewhere in the company; the re-mainder came from DP departments of

other companies, the survey showed.

Of newly hired systems analysts, 41% were already fully trained and came pri-marily from other firms. The remaining 59% were hired as trainees, with two-thirds of that group coming from within the firm and the rest from college.

Newly recruited programmers were divided equally into three groups: pro-grammers from other firms, trainees from within the firm and trainees from outside Computer operators were hired almost entirely as trainees, slightly more often from outside than inside the firm, the report stated.

New DP managers were trained mostly by the computer manufacturers, Pro-grammers and analysts were trained by manufacturers almost as frequently as they were trained in-house. Operators were usually trained in-house.

Commercial computer schools provided virtually none of the training, according to the survey.

Despite the large number of trainees hired, the report warned that there was "no general shortage of trainees." The "no general shortage of trainees." The relatively long time it takes to train staff - nine months to two years for a programmer or analyst, according to the survey - means many firms are looking for trained staff.

The report said there will be an increase in the demand for trained staff, resulting in a "shortage of highly skilled ex-perienced personnel. What is especially important is that computer users should continue to foresee their needs and recruit and train staff in good time."

In an effort to get the most out of

expensive hardware, both computers and people are being used more intensively, the report said. Of computer operators 82% are on shift work and 55% work overtime.

Sixty-nine percent of all installations have programmers on overtime, and 1% of all installations (3% of the large ones) have programmers doing shift work

Pourquoi est-ce que je dois changer de langue? Il ma pris dix ans pour apprendre celle-ci. (Why should I switch languages? It's taken ten years to learn this one.)

Wie kommt es dass der Preis des EDP ist immer höher und höher?

(How come the EDP budget is always going up?)

Obsoleto? Vengo di comprarlo! (Obsolete? I just bought it!)

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#### **Editorials**

#### Part of the Pattern

The acquisition of the Service Bureau Corp. by Control Data was one of the most unexpected computer community events of the decade. The news of the transfer, as a part of the settlement of the suits between IBM and Control Data, was mostly greeted with shocked silence.

The differences in style of business, in the equipment used, and even the nature of the business thrust of the two corporations seemed about as far apart as is possible for two firms in the same computer community.

Yet, the pattern can be seen emerging even before the lawsuits were filed. Control Data, during its decade-plus of existence, has always had an interest in acquiring companies that seemed a little far afield of its immediate operations.

In the early days this involved technical companies dealing with the peripheral units that would surround the mainframes it was building — Rabinow Electronics, for one.

Then came the jump into computer schools, and scientific computer use, with the Ceir merger which also brought the Automation Institutes under the Control Data banner. The Commercial Credit acquisition a few years later also was part of the pattern — and also was a little far afield.

Looked at this way the acquisition of the Service Bureau conforms to the Control Data philosophy and history. Strange today, it may well appear to be the most natural thing in the world tomorrow.

#### Fearing the Computer

Retailers are moving further and further into the computer world – fortunately confined to business applications. Those retailers who have harnessed the computer are grateful for the contributions to profit made by a good system.

But, they must also look at the bad that can be done with a computer. Nobel created the Peace Prize because he hated the thought of the damage that could be done by his invention, dynamite. We may some day have a Thomas J. Watson Peace Prize.

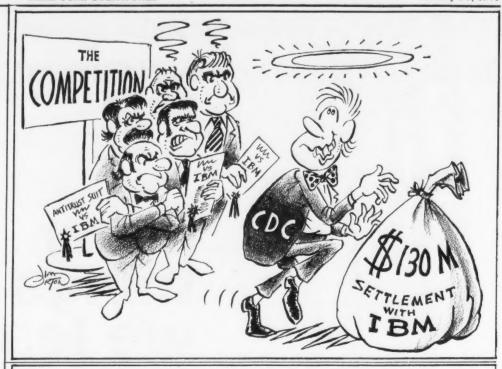
Key men in the U.S. Department of Housing and Urban Development recently raised the question of the application of computers to projecting the social conduct of individuals — and the impact that such a development could have on our justice system.

They point out that our justice system is based on the concept that the individual has will power, so that if deterred, punished and rehabilitated, he will no longer conduct himself as a criminal. But these two men, James W. Evans and Robert A. Knisely, claim that computer profiles will soon predict "with startling certainty" which criminals are unlikely to respond to any rehabilitation effort.

They say: "By examining the records of many prisoners and habitual offenders, the computer may make it inescapably clear that although one cannot predict with total certainty the fact that any individual will remain a criminal, the probabilities are so high as to raise a presumption that he will."

Thus, they are pushing predictive analysis by computers to identify criminals before they commit the crime — and to identify those whose profiles indicate that they cannot be rehabilitated. Society, they say, should isolate such people before they do anything wrong!

(Reprinted by permission from Retailing Today, December 1972)



## Letters to the Editor

#### Recognize Individual's Wants Before Group's

I have followed with mixed feelings Alan Taylor's attempts and those of others to force recognition of groups. These groups run the gambit from antiwar to pro-religion. I am astounded that the simple powers of observation are not utilized.

The DP person has been compared to lawyers, doctors of medicine and other comparable professions, but apparently no one has canvassed the layman to find his opinions of the value of CDP, SCDP, ACM, AMA, AFL-CIO, etc.

I personally believe the layman of today selects his services, products, entertainment and the like based on the individual, quality and price instead of the organization(s) that support these services. Since all of us are laymen to some degree, hasn't the time come to pull our heads from the sand and consider these realities?

H.L. Robinson

Dallas, Texas

#### SS Number Abused By Administration

A Social Security Number XXX-XX-xxxx could be used as an identifier, except that the numbers have been abused, even by the Social Security Administration which never seems to check to see if a person is entitled to a new one.

Just as two digits, "XX," give  $10^2 - 1 = 99$  permutations, the nine-digit Social Security Number possibilities = 999,999,999. But this is not enough for the U.S. population if we all ask for seven different social security numbers in the hopes of increasing our benefits, and lowering the Internal Revenue bite. And, therefore, Computerworld ought to expect that there may be three or more people holding the same Social Security number.

It might not be enough to suggest an alphabet sort, nor even one according to address (we are somewhat free to use as many names and addresses as seem to be needed). I am afraid the Social Security Number will have to go on the butt at birth (or with immigration). But we will

have to agree on which side it should be, so that nobody can show but one when he has two. Richard H. MacCutcheon

Cleveland, Ohio

#### Software Vendors Get No Revenue

Alan Taylor's statement [CW, Dec. 27/Jan. 3]that because of spooling there is "no excuse" for forcing a single form to serve multiple purposes is theoretically correct. A practical consideration, though, is that the IBM-supplied DOS spooling package does not support multiple printers (real or virtual) from a single partition.

Whether this was a design oversight or a design objective to ensure that the sale of additional printers and control units was not impacted is certainly an interesting question.

The fact remains that non-IBM spooling systems support multiple printers from a single partition—and the vendors of this software get no revenue from printers.

Kenneth W. Kert Vice-President

Software Design Inc. Burlingame, Calif.

#### Government Has No Place in Industry

It's getting near the time when responsible members of the DP industry had better wake up to the consequences of the policies being advocated by some of our "spokesmen."

The pages of the DP trade publications have contained, in recent months, an astonishing number of articles, letters and news reports concerning the need for more and more regulation of our industry by government.

We're not meeting our "social" responsibilities, says one; our antitrust laws are inadequate says another; let's get the UN involved (God forbid!) says still another. In the Jan. 10 Computerworld, Messrs. Gilchrist and Wessel suggest that "perhaps the best way the country can manage the computer industry and hence make sure it is used for the public good is to...." (italies mine).

The way is unimportant con-

sidering the much more fundamental issue involved in their bland assumption that it is the country's (i.e. the Federal Gov ernment's) proper function to "manage" (i.e., regulate, control) our industry.

It is a fundamental precept of our American way of life that government exists solely to protect the rights of individuals. To protect our individual rights to life and property, not to abridge them or regulate them, is the essence of freedom. The "public" or "society" is a non sequitur, a non-entity, since it is, in reality, a collection of individuals. In short, the government has no right to manage our industry in any way, shape or form

Robert L. Sullivan

Cambridge, Mass.

#### Bad News for Cobol

This January I'll be starting an informal newsletter devoted to the question of a Cobol replacement language. Anyone who would like copies should send me his or her address and the number of copies desired.

I would also like articles or letters of comment that anyone will be willing to send to the newsletter. It is informal and materials do not have to be thesis-level things. Just things that you'd like to get out for brain-storming and playing with. The title of the monthly is New Business Language. Subscription is free, until further notice, but a bunch of stamps will be appreciated.

Joe Celko

Box 11023 Atlanta, Ga. 30310

#### Bits, Bytes Revisited

In the Aug. 16 issue of Computerworld, a letter by Tom Gilb, entitled "Byte vs. Bit Controversy: Rules of Thumb Inadequate," referred to "Record Compaction Techniques," 8582 IBM Form E20. IBM states there is no such form.

A.B. Tonik

Sperry Univac Blue Bell, Pa.

The correct identification should be E20-8252. According to Gilb, this publication was obsoleted in 1969. Ed.

## **Learning to Read Printouts**

# DPers Would Do Well to Set Up Quality Control Plan

Computer printouts can be very confusing, particularly when they contain information with which the reader is not familiar. This fact probably explains why many data processing managers shy away from using

The Taylor

Report

Alan Taylor, CDP

printouts to obtain information about their systems.

The se managers do not realize, howeasy it can be to learn to read a printout to obtain in-

obtain information about the quality of their equipment and the standard of maintenance it receives.

The cost in computer time is about 5 min/day, and the results can be simply graphed to show trends of failures.

Setting up the quality control system is quite simple. With the cooperation of an operator and a maintenance engineer it takes about one hour.

If the maintenance man is uncommunicative — or worse, if he is too verbose and tries to blind you with figures — you may have to dig into the manuals, or find someone else who has a background in the maintenance area. This is not more than a half-day investigation.

The place to start is in the diagnostic programs - and with

a clean set of tapes. (This is important. I recommend keeping one set of tapes particularly for this operation, and having them numbered so you always know what tape is on what drive.)

Run the diagnostic, generally until the first break in the program. This usually takes about three minutes. Now, unless a bad problem has been found you can unload your tapes, put them away, cut one small table from the operator's log and paste it into a book.

The daily work is over. You now have all you need for complete quality control.

In the case of many DOS users, the table will often look like Table 1.

#### For the Common Man

Most of the information is not necessary to the quality control system. The first column is simply the reference number of the various units written in hexadecimal. (Don't expect these printouts to be written for the DP manager. These are written in maintenance man's jargon which isn't really too hard to learn.)

Hexadecimal is simply based on a count of 16, instead of 10, so that 100<sub>16</sub> is around 250 – and eight (not five) is the half-way point. (That's all I remember and I get on fairly well.)

The second column shows an abbreviation for each of the various devices – RD being the read unit, PU the punch unit, etc.

Now we get down to business. The next two columns under the word BLOCK should be taken together. The set of numbers on the left under OPER (number of operations) is filled, in only if any failures have been noted. The second set of numbers, labeled FAIL, indicates the number of failures.

Again the figure is in hexadecimal. Sometimes you do not have to bother to convert the numbers – since the numbers are the same in hexadecimal as decimal. The reader had four failures in three minutes of operation, while tape 181 had seven. Tape 280, however, had 16 errors – although it's printed as 10.

one problem with many diagnostic aids is that they only count up to "FF" and then give up. FF is a code meaning "more than 256" but really indicates how badly the device has responded to the testing.

#### **Testing Report**

By now it can be seen that the word BLOCK really means "groups of tests performed." It comes from the number of times the program has passed through the block of coding which sets up and evaluates the tests.

There are three more columns to be examined. The first, headed ACUM STAT (Accumulated Status Report – not Accumulator Status), is simply a 16-bit report of the superimposed status words that were sent back by the unit when it

	I/O	UNITS	BLC	OCK	ACUM	NOT	
	ADDR	CLAS	OPER	FAIL	STAT	RDY	RDY
*	OOC	RD	OODF	04	OEOO	X	X
	OOD	PU				X	X
	OOE	PR					X
	OIF	TY					X
	130	DS					X
	131	DS					X
	132	DS					X
	133	DS					X
	134	DS					X
*	181	TP	OO2E	07	OE40		X
	182	TP				X	
	183	TP				X	
	184	TP					X
*	280	TP	006D	10	OE40		X
*	281	TP	O2B8	FF	0200		X
ak:	282	TP	OO2E	07	OE40		X
	290	C.U.				X	

#### The Diagnosis Is Clear

Table 1. The table represents the results of a diagnostic routine after a three-minute test. It lists the number of fault conditions noted in each of the system units during the test period. The contents can be used to provide the DP manager with a graph of the probable number of faults per day, and readings from the graph can indicate the cases of gradual degradation of performance quality.

reported an error.

With the aid of a reference pamphlet, you can discover that tape unit 181 reported the "Device End" status on at least one of the seven times it failed, and that it reported "Channel End" at least once. But you cannot tell whether or not it ever reported both Device End and Channel End at the same time.

In fact, only one of the bits is important for quality control purposes. This is the second bit of the left-hand byte (0200). This bit indicates there has been a unit check and that is all you really need to know. In fact, you will find that you do not even have to bother about that bit.

The last two columns are important, however. Blank entries regarding the number of test cycles run and the numbers of errors reported always mean there were no errors reported.

But this can occur because the units were not tested, as well as when the tests were successful! The last two columns differentiate between the two situations. Units that are marked by "X's" in the NOT RDY column haven't been tested at ali.

#### Flags Make It Easier

The final part of the printout is the flagging asterisks on the left. These indicate the units which were tested and which produced failures. These are effectively equivalent to the one out of the 16 bits in the Accumulated Status item. So we need only look at the asterisks and can ignore the ACUM STAT figure. In fact, with a bit of reorga-

nization, we now have a list of units tested and a list of errors found in a three-minute test. The three minutes, of course, do not represent continuous operation, any more than normal operations are continuous.

The test, however, does represent roughly between onequarter and one-half of 1% of a day's operations. Therefore the estimated number of daily errors can be calculated by multiplying the number in the FAIL column by 200 if you have a one-andone-half-shift operation, or by 400 if you have a round-theclock installation.

Now you have your quality-control figures ready for graphing. As IBM says in its publication, the Midas (Modular Isolation Diagnostic Analysis System) Self Study Seminar: "Through the periodic use of Midas... unit degradation can be spotted prior to its becoming a major problem."

Of course, it is talking about the amount of time its CEs will take to handle the eventual breakdown, but the users' problems begin before that.

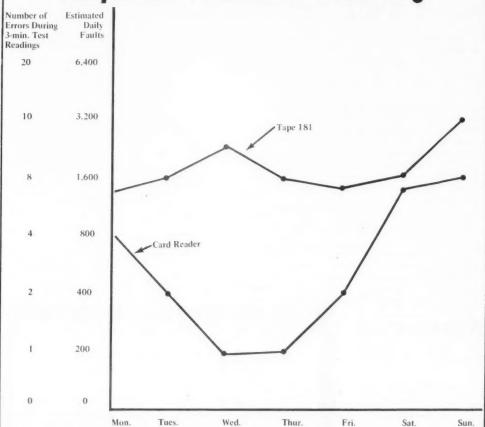
So the advice is just as good and perhaps needed more by user management than the CEs. So why not give it a try? It will

So why not give it a try? It will help you, your staff and your management.

And it only takes five minutes a day.

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# Simplified Estimated Fault Log



The figure shows a simplified estimated fault log of the type that can be used by DP managers to keep track of the quality of their installations. All the information is obtained from the type of information included in the diagnostic record printout, illustrated in the table. The figures on the left show the hexa-

decimal number of errors which appear on the printout, while the figures alongside show the decimal equivalents, multipled for a 10-hour daily running time. The multiplication factor used was 200. Entries are made for each day, with the Monday figures coming from Table 1.

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DUCS-VI will be available during the 3rd quarter of 1973. Version 6 will support both local and remote IBM 3270 Display Systems providing users with a convenient means of utilizing the enhancements of the IBM 3270 System.

Requests for DUCS-V should be submitted to C F S. License agreements, DUCS-V abstracts and other details will be sent by return mail. Inquiries may be directed to Mr. Richard K. Goran.



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# Carefully Planned Computer Selection Was Sandbagged on Corporate Ladder

By Miles Benson

Special to Computerworld Company T had a problem.

The old computer, one manufactured by a well-known company which dominates the computing field, was scratched. There was no way it could solve the corporate problems in the months ahead. It was time to replace the current hardware.

replace the current hardware.

The firm decided to do the job right. It picked a team of technical people to make the new computer selection. To emphasize the breadth of the project, it adopted a more inclusive name — Computing Moves Ahead (CMA). And the selection team had full rein.

#### How to Select

How does one go about the task of computer selection? Every installation — and every manager — has tried to do the job the way he thinks it should be done. And very few have come up with the same solution.

The CMA team decided to

The CMA team decided to cover all the parameters and spend as much time as necessary to do a thorough job. With several million dollars of expenditure ahead, spending a little extra on selection seemed prudent.

First, the team analyzed the work load and determined what kinds of jobs it had, which were I/O bound, which were core bound and what that meant in terms of requirements.

terms of requirements.

Then the team surveyed the future work load and polled current users, and potential users, trying to get a handle on projected requirements.

It studied the impact of conversion, and possible aids for conversion, based on where they were and wanted to be. The team analyzed software requirements, extrapolating present language usage to future language usage, and present utility program usage to future utility usage, and defined those needs.

The team looked at computing trends and research-produced predictions for future developments, and added those requirements to the total picture.

With all of this survey material in hand, the team defined the CMA needs. Out of the needs came a specification of what kind of computing facility would satisfy those needs.

The specifications were then exposed to the Company T world. Management and technical people alike got a chance to examine the specifications and

criticize them. and bend them to be more realistic. And out of this test bed came a more sound, more real set of specifications.

The time had come to move CMA outside of Company T into the competitive world. The specifications were sent to various vendors and bids were invited. And the CMA team sat back to await the responses.

#### **Something Happening**

But something unusual was happening here. The CMA team did not study available hardware and confine its require-

# Viewpoint

ments to what was available in the marketplace. It concentrated on requirements and left it up to the vendors to decide what to pull off the shelf or the drawing board to statisfy those requirements. In some ways this seemed idealistic. But that part of the CMA project worked.

Each vendor who responded picked something from his real-world offerings, or soon-to-be real-world offerings. And although the offerings didn't satisfy all the requirements, they struck an optimum compromise between requirements and reality.

#### Rating the Requirements

As the bids came in, the CMA team shifted gears and devised an elaborate evaluation scheme for breaking the bids down into some measurable results. It assigned weights to the various requirements and devised equations for aggregating weighted

scores into hopefully meaningful totals.

Many people pointed out that weighting schemes often turned out to be supersensitive to the arbitrary weights assigned. And so the CMA team conducted dry runs on their weighting and scoring scheme, checking it out for stability.

Finally, all the bids were in, and all the evaluations had been run. And a clearcut winner had been established.

The CMA team made a formal presentation to management. It described the approach, reviewed the analysis and proclaimed the winner.

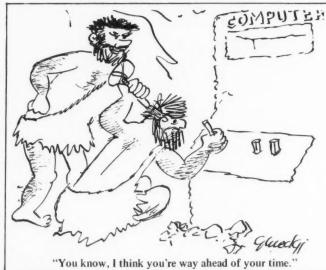
And then a funny thing happened. CMA's choice, a brand B computer from a company just breaking into the large computer field, didn't get ordered.

#### Cost-Conscious?

For a while, nothing got ordered. The CMA team rationalized that the delay was simply corporate bureaucracy mixed with cost-conscious caution.

But then an order was placed. Not for the brand B machine. But for the latest giant from the well-known company which dominates the computing field. It never was fully explained to the CMA team why the carefully created advice was ignored. Something about compatibility, and vendor reliability, and some other factors which the team though it had covered in its analysis. But nothing satisfying to the team.

Only the nagging feeling that the issue had really been resolved, somewhere up the corporate ladder, before the work had begun.



\*

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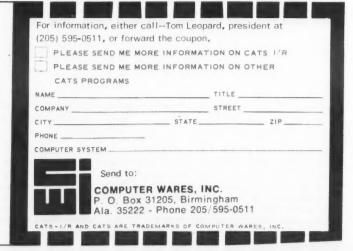
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#### Random Notes

#### DOS/360 Utilities Updated To Run With 370 and 3330

LOS ANGELES - DOS/360 users moving over to 370 systems with 3330 disks can utilize updated versions of two packages from Associated Computing Ser-

vices Inc. (ACS) on their new equipment. One, still labeled Relo/360, enables DOS/370 users with 3330s to store their application programs in relocatable form. The updated DOS/Audit package, on the other hand, inserts a date field in the source statement library whenever change is made in a program.

Each of the new 370 packages is installed by mail, ACS noted. Each costs \$1,200, and can be ordered from 12011 San Vicente Blvd., 90049.

#### Nova, SPC-16 Cross-Assemblers Set to Run on Many Mainframes

SAN DIEGO - Programs for Data General Nova or General Automation SPC-16 minis can be developed on various full-scale CPUs with one of two crossassemblers just released by Decision Science Inc. (DSI). DSI-Nova accepts basic Nova Assembler Language while DSI-CAP-16 works with CAP-16 source

code, for the SPC-16.

Each is in Fortran IV and can be installed on any Fortran-supporting main-frame. The 360 version should fit in 32K bytes, DSI said. The Nova package costs \$1,500 and the SPC-16 \$2,500, from 4508 Mission Bay Drive, 92109.

#### **User Shapes Ledger Reports**

BURLINGTON, Mass. - Users of Software International's General Ledger system, previously limited to a set of "hard-coded" reports, can now specify both the content and format of their printouts, at execution time, with a control-carddriven report writer feature added to the system.

The parameter options include layout of both columns and rows of information headings, titles and types of calculations to be performed on data before it is reported. The enhanced ledger system, in ANS Cobol, operates under DOS, OS or IMS/360, and is available from 279 Cambridge St., 01803.

#### Loan System Extended

CHERRY HILL, N.J. - Loans made on a simple interest basis can have interest calculated on daily outstanding balance with an optional subsystem now available as part of the Bankserv Installment Loan System from Arthur S. Kranzeley & Co.

Written in ANS Cobol, the complete system, including the simple interest process, can be installed on IBM, NCR or Burroughs CPUs. The 360/370 implementation requires 120K bytes of storage. The system costs about \$35,000 depending on customization needs. Kranzeley is at 1010 S. Kings Hwy., 08034.

#### Standards Doubtful

# TG 13 to Study Benchmark Techniques

**By Don Leavitt** Of the CW Staff

WASHINGTON, D.C. - Better under-standing of methods to define workloads, benchmarks and test procedures, rather than standards to be followed in those areas, are the likely results when a still-forming task group completes its basic work for the National Bureau of Stan-

Task Group 13 is being organized under the Federal Information Processing Standards (Fips) Coordinating Committee, but experience may show that required standards of operation "simply are not suitable" in the areas to be studied, according to TG 13 Chairman Oliver Kinney of Mitre Corp.

Since benchmarking "does not have the outside commercial support that is available in the simulation systems and hard-ware and software monitor area, it appears deserving of a dedicated work group within the Federal Government," Kinney was told in his preliminary in-

Though TG 13 will, in part, serve as an interagency "forum and central ex-change" of methods and problems, both Kinney and Dr. Joseph Harrison, chair-man of the NBS Fips Coordinating Committee, expect the group to seek relevant information from users both in and out of the government and, similarly, to make its findings available to the broadest range

of interested users.

The precise "charter" for the new task group is still being written, but Kinney has been asked to gather material on the problems of workload definitions and descriptions and of benchmark/workload representations "including synthetic pro-

NBS has also said TG 13 should identify and design "technically accepted methodology, criteria and procedures" for benchmark execution in the measurement of both computer systems and time-shared services. That part of the work should include test data and monitoring require-ments, according to Kinney's instruc-

Finally, TG 13 should prepare federal uniform "practices or standards" for Fips Coordinating Committee consideration, Kinney was told in early December.

#### Some Definitions

Workloads are just that - that actual work a computer system is to perform, in terms of instruction mix and the like. Benchmarks are tests in which workloads in one form or another are put on actual computer systems to see how they per-form, and these tests are often used to compare two or more proposed config-

Synthetic programs, Kinney explained, are nonproductive patterns of instructions which represent in miniature the instruction mix within a workload. They are not simulation models although they share with simulation the ability to get results quickly. At Mitre, Kinney noted, a synthetic program representing a month's work on a mainframe ran in three seconds, with worthwhile results. Inclusion of concern for methodology

to test the cost-effectiveness of time-shared services has been cited by one industry observer as potentially one of the most significant elements for the new task group study, especially in view of users' growing interest in the lack of understanding of what some of the avail-able services really offer, and what they actually cost.

Kinney's detailed definition of what TG 13 will do should be ready for review by the Fips Coordinating Committee at its February meeting, he said.

# \$49 Modules Save Record Space, /O and Data Transmission Time

SOUTHFIELD, Mich. - A pair of 360 Assembler Language modules, called Squeez/Unsqueez, costs only \$49 but may save users considerable space on disks or tapes and time in I/O or data transmission operations.

The modules compress and expand character data containing strings of three or more blanks. They are available from Computer Service Corp. (CSC) which claims a 42% savings in space needed, after it applied the Squeez operation to its own Cobol source statement library.

The logic of the modules can handle

individual records up to 35K bytes long, and individual strings of blanks as long as 256 bytes within each record

Compressed records not only take less storage space, the company noted, but can be passed through I/O and data transmission operations faster than full-length records. Some processing time will be required, however, to perform the compression and expansion operations.

The modules can be accessed through CALL statements in the user's Assembler, Cobol or PL/I application program. The same parameters are passed for both modules and include a count field to show the length of the data in the sending field; the name of the sending area; and

Data is compressed by the Squeez module whenever more than two blanks are found. At that time a flag value of hex 'FF' is inserted in the outgoing data, followed by a one-byte count indicating the number of blanks (minus two) elim-

Squeez will not perform compression if it finds a hex 'FF' already in the incoming data. Conversely, Unsqueez reverses the Squeez operation as it finds the hex 'FF' flag.

The combined modules require only 1,200 bytes of storage for coding. I/O area size is determined by the user.

The package is available from 23225 Northwestern Hwy., 48075.

# 'Pass' Adds Personnel Process To User's Own Payroll System

KING OF PRUSSIA, Pa. - IBM 360 users currently operating with simple payroll systems can extend their operations with the Personnel Accounting and Skills Search (Pass) system from International Systems Inc.

Pass is used to create and maintain a data base of personnel records, including current status and history of all em-ployees. An interface between preexisting payroll systems and Pass will be provided by International, a company spokesman

#### **Continuing Story**

Current status fields within the Pass files are updated, through the interface, when-ever a change is made in the payroll files. Pass also provides for the insertion of narrative comments which become part of the history segment of the Pass file

The personnel system produces a variety of management reports including salary/ performance review notices, seniority listings, status and history, sick days register Equal Employment Opportunity (EEO) reports.

Two levels of search are provided by the system, according to the company. One level allows a search of the data base for

single- or multiple-skill codes. The second allows a comprehensive search based on various parameters such as education, salary range and years of service. The Pass logic is written in Cobol and source code is distributed so users may

make modifications. As shipped, it requires a minimum of 20K bytes of core, but may gain in efficiency if more core is available, the company said.

The system operates under either OS or DOS and utilizes three tapes or two disks. The package costs approximately \$10,000, depending on the complexity of the programming needed to interface Pass with the user's payroll system.

International Systems Inc. is at 150 Allendale Road, 19406.

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Company		
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City		
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#### 1. Please circle one number in each category.

(This information is necessary to provide a better forum for you.)

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  04 Utilities/Comm. Sys./Transport.
  05 Wholesale/Retail

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  Management
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- 05 Lawyer/Accountant 06 Engineering Mgmt./Scientific/R&D 07 Sales/Marketing/Account Exec. 08 Librarian/Educator

#### 2. Please check the appropriate city:

- Feb. 13-15 (Tues, Wed, Thur) Washington, D.C. Feb. 20-22 (Tues, Wed, Thur) March 5-7 (Mon, Tues, Wed) March 13-15 (Tues, Wed, Thur) March 20-22 (Tues, Wed, Thur) March 27-29 (Tues, Wed, Thur) April 3-5 (Tues, Wed, Thur) New York Atlanta Houston Anaheim San Francisco
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- Conrad Hilton Hotel Convention Center (Forums & Exposition) Sheraton Cleveland (Hotel Rooms)

#### 3. Check the day(s) you will attend the Forums.

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- ☐ Day 2 Data Communications 9 am-2:30 pm
  ☐ Day 3 Installation Management 9 am-2:30 pm
  NOTE: Afternoon Sessions are open to all free of charge

- 4. Your enclosed check will cover all workshop materials, luncheon, Forum admission and admission to the Exposition Hall (make checks payable to "The Computer Caravan")
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For additional registrations, copy this form - or write for extra copies.

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# FOR THE 1973 COMPUTER USERS' **FORUM & EXPOSITION-The National** Computer Conference that's coming to you.



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Each day of the three-day show will feature a different topic. You'll be able to air your problems. and learn how others have solved theirs. You'll ask questions, give opinions - and get answers. And you'll come out of the Forum with some new ideas on making your EDP operation more efficient.

#### **FORUM TOPICS**

#### Day 1 - Data Entry

Including panel discussions and work-Keypunch Replacement (shared processor) Intelligent Terminals Direct (on-line) Data Entry

#### Day 2 - Communications

Four panelists will discuss two top issues:

**Data Transmission** 

- a) dial-upb) leased lines/broadband
- **Equipment Selection**
- a) communications processorsb) control equipment (terminals, modems)

#### Day 3 - Installation Management

Panel discussion on management aspects and workshops on specific techniques in the following areas:

Personnel, recruiting and training Programming management Independent Peripherals

- a) memories
   b) other peripherals
- Computer Caravan/73



COMPUTERWORLI





#### Forum Attendance is limited

In order for the Forums to work, attendance is strictly limited. So don't wait too long to save your

#### OPEN SESSIONS

New for this year, we'll be conducting open sessions each afternoon for anyone who wants to attend. Each day at 2:30 a different subject will be opened up for discussion and controversy. Here's the schedule.

Day 1 - Data Communications Planning

Day 2 – Software Evaluation Panel
Day 3 – Small Systems Panel

The expanded Exhibit Floor will be open from 10 to 6 each day. A variety of leading companies will be there with their latest EDP products and services. And you'll have plenty of time to look at everything that interests you. It's an excellent opportunity to stay ahead of this fast-moving industry. And if you have to make decisions, you should be there. (Advance registration is not required for the Exposition.)

# Data Briefs

#### Western Telecommunications Starts Its Data Service

DENVER - Western Telecommunica-tions Inc. has become the second specialized common carrier to offer data services. The firm's first circuits provide high-speed data links to Cubic Corp. for a classified government project.

The circuits, operating between San Diego and Yuma, Ariz., include a 100 kbit/sec channel and a 50 kbit/sec channel. The higher-speed facility is "believed to be the first 100 kbit/sec service on a common carrier system, according to Western Telecommunications.

Cubic Corp. is utilizing only a portion of the Los Angeles to El Paso, Texas, route which the FCC recently approved for the specialized carrier.

#### Century 50 Gets RBE

DAYTON, Ohio - NCR has developed a Remote Batch Entry (RBE) package to allow the Century 50 to operate as a satellite processor to larger non-NCR systems which use binary synchronous communications.

RBE will allow the 50 to operate with mainframes supplied by IBM, Univac, Burroughs and CDC, the company said. In a network operation the 50 will "retain its independence as a separate processing system handling local applica-tions when necessary, NCR said.

The software is loaded via a card deck and control is exercised through inquiries printed on an I/O writer. The package is free to Century 50 users.

#### **CSMA Seminars in Five Cities**

WILMINGTON, Del. - The Communications Systems Management Association is planning a national series of seminars dealing with user selection techniques of data and other communications equip-

The one-day sessions will be presented in New York, Philadelphia, Washington, Chicago and San Francisco between June

package of speeches from the CSMA conference held last year in Chicago is available for \$10 from the association. Information on CSMA activities is available from Suite 1003, 1102 West Street, 19801.

#### **Terminal Combines Visual, Inquiry**

COLMAR, Pa. - The CSI Model 180B Visual Display/Data Inquiry terminal from Credit Systems Inc. is designed to replace teletypewriters or CRT terminals at a lower cost.

The \$250 CSI terminal features a 16-key data entry and inquiry keyboard, an 8-character display screen for verifica-tion and responses to inquiries, and nine back-lit panels for frequent responses

Delivery is 90 days from Route 309 and Advance Lane, 18915.

#### First Users Say

# 3705 Application Software Inadequate

Of the CW Staff NEWTON, Mass. - First users of IBM's 3705 programmable front-end processor are finding software implementation often takes considerably longer than pected.

The amount of time required to integrate a 3705 into a teleprocessing installation is apparently related to the amount field-engineering support which local IBM branches can provide for the user.

Pending availability of the Network Control Program (NCP) for the 3705, present users are operating their front ends in 270X emulation mode. But many users will not be able to switch to the NCP, unless IBM announces NCP support

"We're in the throes of getting the 3705 off the ground," one user with a 370/155 said. "Up to now we are not too happy about the support," he said. The field engineers are trying to help us but I am not sure they have all the answers.

not sure they have all the answers.
"I didn't really think the education was what it should have been. We went to a one-week 3705 emulator class and the available documentation was inade-

available documentation was inau-quate," he said.
"The 3705 is not as reliable as the 2701," according to Bruce Armour, sys-tems analyst at the University of South-ern California. "We have had channel interface problems which cause checks on the multiplexer channel," he said. It took

IBM about three weeks to correct the problem.

front end is connected to a 370/155 and the channel checks occurred when the 3705 was interfaced with the mainframe. A field modification had to be installed, he said, to eliminate the channel checks.

USC is running binary synchronous devices on the 3705 at speeds up to 50 kbit/sec, Armour said.

At Mitre Corp. a 3705 has been operating with a 155 since last July, according to Jim Hanks, systems programmer. "The thing has been incredibly reliable. We did have some minor 'glitches' in the implementation process but we were in production the following morning."

The 3705 replaces a 3702 and "for the same money we have also been able to implement two high-speed RJE lines with Hasp, he said. This was done just by "genning in" the 2701 characteristics into the 3705. It would have cost about \$800/ mo more to have the same capability without the 3705, he said.

The 2702 was handling about 23 lines of 2741 terminals and TTYs. These were all switched to the 3705 in one evening. At first the TTYs did not work correctly. "When we typed in Log On, Carriage Return, the line would drop," he noted. The reason was that TSO issues a Read

chained to another Read instruction, he said. It does a Halt I/O to stop the second read when it is ready to write back the

response to the second read.
"But their logic was, given a Halt I/O, the intent of the host CPU was to hang up the phone line," he explained. But IBM experts figured out a correction in

The 3705 emulator also mishandled the Attention interrupt and was feeding two Attention instructions into TSO. But IBM field engineers fixed this "non-crippling problem in about a month.

The NCP will require "a substantially larger" 3705 than the 16K model now installed, Hanks indicated. "A casual IBM estimate at a recent Guide meeting indicated about 90K would be required to allow adequate buffering," he added.

This would make the 3705 about twice

as expensive.

"We've had far worse support from IBM in Raleigh with Tcam than we have with the 3705," Hanks said. "We were running level 1.1 Tcam and in going to release 21.6 of OS, we put in level 4 Tcam, and that was terrible. We had to back up to level 2 to run TSO, and they haven't fixed the problem yet."

The university has no plans to switch from emulation mode to the NCP because IBM has not announced any applications programming support, he added. At present the NCP can support only the Telecommunications Access Method.

"There is no way for us to go to NCP," Armour said, "because we want to run TSO under NCP." But that means we have to go to VS2. The university is planning to upgrade to a virtual memory 370/158, but in order to use the NCP the present jobs would have to run under

"We are stuck because the 3705 can run only with NCP or the emulator," he said. But USC also runs Hasp and APL and these are not supported under the NCP. The only thing that will work with the NCP is Tcam, so only the programs that interface with that access method will operate with the NCP, he added.

One West Coast user is seriously considering replacing its 3705 with an independent processor. "We're keeping the 2703 we use to run production jobs because we are a little queasy about the reliability of the 3705," he said.

"All IBM has done so far is bring up a few ports at night to try out the Tcam. That seems to work okay but most of the problems have been with the Administrative Terminal System (ATS), which is so very primitive in the way it handles com-munications," he said.

The independent front end being considered is the Comten 3670, which is 3705-compatible, the user said. "They will have emulation, NCP and an operating system that will allow the two to coexist," he said. This will be extremely useful for users who can run ATS under emulation, and TSO under NCP, he said.

# New Carriers Hit AT&T's DDS; MCI Schedules Intercity Charges

WASHINGTON, D.C. - Competition between AT&T and the specialized common carriers appears to be heating up. The specialized carriers recently filed vigorous objections to Bell's application to introduce its Digital Data Service to introduce its Digital Data Service (DDS) and Microwave Communications Inc. announced intercity prices that averup to 40% less than comparable

Six specialized carriers have filed objections to AT&T's DDS applications – led by Datran which told the Federal Comwhich told the Federal Communications Commission that Data Under Voice (DUV) and DDS are designed "to extend Bell's monopoly into the field of data communications."

#### 'Damn the Public?'

The parameters and services proposed by AT&T are nearly identical to Datran's plans and are an attempt by Bell "to enter the data market before the specialized carriers, regardless of the public interest...to preclude competition in the data communications" area, Datran told the commission."

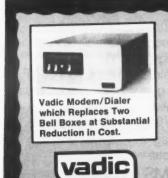
In addition to Datran, MCI, Southern

Pacific Communications Co., Western Telecommunications Inc., Eastern Microwave Inc. and the independent Data Com-munications Manufacturers Association all filed objections with the commission

In a related area, MCI said it would offer "4K plus" services to its customers, Each 4K plus channel will provide users with a 4-wire balanced and equalized transmission pathway, MCI said. The specialized carrier will assume "management responsibility for end-to-end service," according to an MCI spokesman. ice," according to an MCI spokesman. The rate structure announced by M

includes five data offerings ranging from 300- to 9,600 bit/sec serving 21 major cities. A comparison of the MCI prices with comparable Bell offerings shows users can save from 28% to 44%, depending on speeds and options, MCI claimed

An independent comparison of AT&T and MCI rates by the Center for Com-munications Management shows that at 4,800 bit/sec MCI will be 10% to 20% below Bell, and at 2,400 bit/sec, the new carrier will be 30% to 40% below AT&T. The comparative study is available from Box 324, Ramsey, N.J., 07446.



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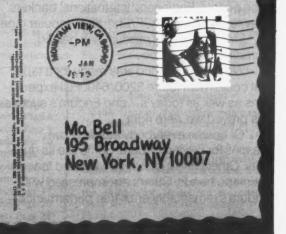
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# COMPUTERWORLD

**CW** Supplement

★ The 360 Lives On ★

January 31, 1973

Supplement Page 1

"The 360 is not dead - long live the 360!" That's the battle cry of many users who are continuing to enhance their "obsolete" systems and who have given these independently "souped-up" 360s a new lease on life.

This supplement describes the enhancements, looks at the trade-offs and discusses why users are still finding their 360s cost-effective.

# Firm Swaps 145 for 360/50 **And Users Share Happiness**

"The real savings are in comparing the 370/155 with the 360/65. It is possible to get equal throughput on the Model 65 and save \$10,000/mo." – auser

There is no doubt that for certain applications an IBM 370 system is the most cost-effective mainframe, but more and more users are discovering a surefire w to retain a solid niche for their 360 mainframes.

In most cases the decision to stay with a 360 is based on careful trade-offs and evaluations. The comparisons are usually made between an all-IBM 370 and a 360 obtained on third-party lease and enhanced with independent main storage and peripherals.

The Computer Research Co., which provides machine time to users who need access to specific types of systems but can't justify such a capability in-house, replaced its 370/145 with a 360/50.

"We had 256K on the 145," explained

Ron Ellis, president, "and our customers were looking for core and a 2314 disk capability." The company considered expanding the 145 to 512K but such an upgrade was "absurd based on costs and



Ron Ellis, Computer Research president, checks on some third-party lease prices. the fact that real throughput on the 145

'was just not realized.' "I am certainly not anti-IBM," Ellis said, "We have a 155 which is serving us well and we plan to install a 135," he said. "But the 145 was just not the right machine for the RJE customers that were buying time on it," he explained.

After extensive evaluation, Ellis and his company decided that a 512K Model 50 was cheaper and more cost-effective than

"You have to determine what you can buy for about \$15,000/mo," Ellis said.

the 256K Model 145.

While the 145 was faster than the 50, this was not an important criterion for the RJE customers accessing the 370 system. An upgrade to 512K was definitely indi-

The decision to go to a Model 50 has aved Computer Research about \$85,000/yr, Ellis estimated. And that has allowed the company to drop its rates about 10% for users who now access the Model 50.

"Most customers were I/O-bound and were not hurt one bit by our switch to the 50," Ellis said. One user was compute-bound when he switched his jobs from the 145 to the 50, and that customer was provided with time on the 155 Ellis gaid. 155, Ellis said.

There were some inefficiencies with the Model 50. About half of the 512K was taken up with the OS MVT, but this still left customers with another 256K they could use, Ellis said.

Calculating the net effect of running jobs on the Model 50, Ellis said customers experienced "zero degradation" on I/O-bound jobs. On compute-bound jobs there was a "50% degradation" on some jobs, but thee users were just switched to the factor 155, he added the faster 155, he added.

The \$85,000/yr savings were not just based on one specific configuration—they were based on a 256K 145 compared with a 256K Model 50. But savings of \$45,000/yr were still possible when comparing a 512K Model 50 with the 256K 145, Ellis said.

"But the real savings are in comparing the 370/155 with the 360/65," Ellis said. "It is possible to get equal throughput on the Model 65 and save \$10,000/mo over the 155, he added.

Based on this comparison of 512K systems, Computer Research recently insystems, Computer Research recently installed a Model 65 as added backup for its 370/155. Asked why his firm did not replace the 155 if the Model 65 was more cost-effective, Ellis stressed that the 370 was a purchased machine.

But the company was able to achieve some cost-effective upgrading by ex-

From New...to Old





Computer Research Co. replaced its 256K 370/145 with a 512K 360/50 (right). Diane Morris, vice-president, Madansky & Assoc. enters a job on the "new" 360.

panding the 155. "We managed to expand

the system from 1M bytes to 1.5M bytes with no increase in costs," he said.

The earlier 1M-byte system included 512K of purchased IBM core and 512K of rental core from IBM which cost the firm substantial overtime charges based on the 500 hr/mo average operation of the system. An upgrade to 1.5M bytes would have required the purchase of an

\$83,000 storage adapter from IBM before the system could be expanded to 1.5M bytes, Ellis said.

Instead, Computer Research replaced the 512K memory on IBM rental and installed a 1M-byte memory box from Cambridge Memories, Ellis noted. While he admitted this comparison was based on IBM charges with overtime rates, a (Continued on S/Page 2)

#### 'Replaces' Dual 135s

# Edos Helps Boost Model 40

In many cases, the choice of a 360 over the installation of a 370 involves cost performance trade-offs measured according to hardware capabilities

But as more meaningful independent software becomes available, some users can enhance their CPUs and increase the efficiency of their installations by carefully selecting non-IBM software.

One of the most ambitious 360 software systems now available is Extended DOS (Edos) from The Computer Co., Richmond, Va. First announced in the spring of 1972. Edos has proven an effective 370-stopping enhancement for several

users.
"We will be able to do the same work on one 360/40 that we previously had allocated to two 370/135s," said Owen McBrien in describing the value of his independent operating system, plus some independent peripherals. McBrien first began using Edos last year at Media General Inc. where he is director of data processing. He had a jump on other innovative users since his installation served as a test site for much of the Edos software, but he is quite willing to share his results with others.

#### Just the Basics

"We experienced a 13% to 15% increase in processing throughput with just basic Edos," McBrien said. The comparison was based on earlier operation on the same mainframe using IBM's DOS.

"The improvement was based on the he said. In the first month Edos was monitored, the company had 10% increase in workload volume, McBrien estimated.

The execution time of individual programs was not affected by Edos but the "job set-up time" and the "program load time" were improved. The reasons for this increased efficiency are the relocatability of all programs, regardless of language to any partition; and the block language, to any partition; and the block fetch feature which makes the "loading program much more efficient than IBM's," the user said.

The major operating advantages of Edos, which are similar to OS/MFT include automatic volume sensing, partition load balancing and volume dump restore. These Edos features "reduce the amount of operator set-up time/job and therefore they reduced the time the system was sitting idle between jobs," McBrien said.
An optional Edos feature provides six-

partition support.
The introduction of Edos has reduced the operations overhead and freed up CPU time, he said. "With an increase in workload we had a decrease in meter hours during the first month," he said. From this we calculated that we had about a 15% increase in processing," he

#### More Savings in Sight

Media General is operating with a rental IBM Model 40 so the reduction in operating hours meant a savings of about \$600 for the first month, McBrien said. But the firm is replacing its rental machine with a similar configuration from a third-party leasing company. And when the third-party Model 40 is installed, there will be no overtime charges at all, he said.

(Continued on S/Page 6)

#### On the Inside

Independents Ponder Virtual Storage Benchmarks Prove 360's Worth Independent Software Stresses 360 Smaller Models Not Forgotten 30s May Handle Medium Nets Unwritten Fear Strikes Those Who Mix Disk. Cache Memory for 65 Users **Computer Sharing Cuts Costs** 50 Better Price/Performer Than 145 Third-Party Lease Reduces Budget

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#### **DAT Box Coming?**

# Independents Ponder Virtual Storage for 360s

By Ronald A. Frank

Of the CW Staff
It is certainly not unusual for a 360 user to consider acquiring a 370 system. Undoubtedly the user's local IBM representative has more than once described the added capabilities, and perhaps even status, involved with the operation of "this year's model instead of last year's model."

But most users no longer accept the status symbol approach. And few IBM people try to appeal to the user in this way. So the trade-offs boil down to a dollars and throughput comparison.

In the technical area the user has to consider the impact of a virtual operation on his shop. In almost every other area, the independent suppliers can duplicate (and often surpass) IBM product offer-

Memory expansions to almost unheard of limits are becoming routine, faster

tapes and disks often outperform the IBM units they are designed to replace, and independent terminal equipment is normally faster and cheaper than IBM's. But the advantages virtual memory will bring to the user are still relatively unknown.
Only as IBM begins to provide software

enhancements and new releases to its various VS operating systems will the real impact of virtual memory operation become apparent to the user

And if it turns out that this software support offers really valuable capabilities to users, the independents have some interesting options available to them.

#### DAT Box

Probably the most glamorous possibility will be the addition of the Dynamic Address Translation (DAT) to the 360, a capability that has been attracting the interest of users and vendors alike [CW, Nov. 15, 1972] for some months.

This feature will be installed on purchased 155s and 165s by IBM to convert these systems into 158 and 168 configurations

But one crucial event holding back a DAT box for the 360s is that the first IBM feature for the 155 is not scheduled for installation until the second quarter of this year. Presumably any independent version of a DAT feature will be based on the IBM device which it described last

August as a "hardware facility."

"The problem with developing a DAT box is that we really don't yet know much about them," according to one independent vendor's marketing man.

Nevertheless, most experts agree that a

Nevertheless, most experts agree that a virtual-type feature will be available for at least some 360 models before the end of the year.

"Some vestige of virtual storage for the 360" will be available soon, according to Edward O. Boutwell, Jr., executive vicepresident at Compata Inc., a consulting firm.

#### Several Options Available

A virtual memory feature could be implemented on the 360s in several ways, according to Boutwell. The options include hardware, software or microcode. And almost any version will require modifications in at least two of the three areas, he said.

The Models 50 and 65 will be the first 360s to get the virtual capability, he predicted.

One of the major incompatibilities between the 360 and 370 is that there are a small number of instructions that can run only on a 370. But these instructions which can be executed only on the 370 are not a major headache to most users.

But this 360/370 compatibility gap is bound to widen as more details of the IBM VS operating systems become known. Some experts see the IBM DOS stabilization as an indication that signifi-cant enhancements will soon be an-nounced for the 370 software.

Despite this stabilization, however, the opportunity for independent software development on the 360s seems better than ever. "Users are really beginning to focus on the weaknesses of OS and DOS," Boutwell said. Among the areas that can stand improvement by the in-dependents, he predicted a new scheduler for OS and improved job management packages and language translators for DOS.

One of the more intriguing approaches to enhancing the 360 predicted by one consultant involves the use of simulation. Non-compatible 370 instructions could "executed" on 360s using independent emulation software, the consultant sug-gested. The emulation method might also be a feasible way to add virtual memory capabilities to the 360 line, he added.

#### Firm Trades In 145. Users Reap Benefits

(Continued from S/Page 1)

50% increase in memory was achieved without any increase in costs, Ellis said. In attaining the throughput of a 155 on the Model 65, Ellis has made some significant independent peripheral enhancements. The 65 now includes one 3330-type disk system from Storage Technology Corp. and two 2314 systems. In addition, the 65 has 1M byte of Ampex ECM core storage. Computer Research plans to add Ampex core with the cache memory to the system soon and with this added capability Ellis believes he will reach a performance level just "as fast as native core.

#### Souped-Up Model

"This combination on the 65 will make it comparable to the 155 at about half the cost," Ellis said. To be more specific, a Model 65 with 512K third-party leased main memory, a 1M-byte Ampex core box with cache memory and 3330-type disks from Storage Technology Corp. will provide the performance of a 370/155 with 1.5M bytes of core and IBM 3330s. The Model 65 will also save \$185,000/yr, Ellis said.

But despite the savings Ellis is not ready to abandon his 155. "There are some instructions that our customers use that can only be executed on a 370 and not a 360," Ellis said. In addition, the Model 65 does not have a hardware emulator to allow customers to run DOS under OS, he

Computer Research also has two 360/30s. One of these will be replaced with a 370/135 early in 1973, Ellis said. The 135 will be a good bargain for Model 30 users, he believes. "These users will be able to go to a 135 and get the throughput of a Model 50," he predicted.

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# Five Months of Benchmarking Convinced User to Stay With 50

For most users, the comparison of mainframe systems is based on cost and throughput timings of a few jobs run on several systems. But one midwestern company conducted an intensive five-month study during which it benchmarked a known job mix from its 360/50 at various outside locations, including sites made available by IBM.

The benchmarks were designed to evaluate the relative throughput capabilities of 360 and 370 systems. Included were comparisons of virtual and non-virtual operations.

The benchmarks convinced the user to stay with his independently-enchanced Model 50, with a future upgrade to a Model 65. This conclusion was based on relatively small throughput improvements from the 370s tested. And in some cases the 360 was actually faster.

The jobs used in the benchmark evaluation were based on the firm's Model 50 which has 768K of core including 512K of native memory from IBM and 256K of AMS core supplied by Itel.

The in-house configuration includes 16 Telex 2314-type disks on selector channels 1 and 2; four 2403-1 Telex tape drives on selector channel 3; and the remaining I/O peripherals including printer, card reader, etc. on the multiplexer channel.

The user also has an in-house Model 65 with 512K of native IBM core and 1M byte of IBM 2365 LCS storage. Both systems are leased from Dearborn Computer Leasing.

One of the most interesting benchmark results demonstrated that the 370/145 with an IBM 2305 fixed head disk ran no faster than a system with just 3330s and 2314s. (see chart 3)

Among the problems encountered in running the benchmarks was the inability to get Bdam to work under VS1. A great deal of time was devoted to debugging because it was not possible to debug under paging. "Each time something went wrong, it was already destroyed in memory," the user said.

Many patches or modifications to VS1 were required to get the benchmarks to run. When a tape or disk was not ready, the 370 would not give out a message, the

user said.

"Everything would just hang up," he said, "without getting any communications back under the VS paging system."

On the 360, a message would be generated to flag a peripheral that was not ready, the user explained.

In the paging environment of VS 1, if two partitions were allocated to terminals, the system might encounter delays up to 12 minutes when both partitions "would seek access to the same file," he said.

These delays were based partly on joint

System	Size	Time
360/30	64K	35 min
360/40	256K	28 min
370/145	256K	20 min
370/135	256K	20 min 20 sec
360/30	256K	26 min

Chart 2. In one "screened job mix" the Model 30 with 256K was faster than a Model 40 and almost as fast as a 135 and 145. The software included IBM's CS 30 and 40. An IBM 1400-type job was also run "for curiosity."

usage of I/O handling and coding in different programs, he added. The 370 sorts under VS1 were also a problem and ran much less efficiently than Sort II under OS.

"The Model 65 with Telex peripherals ran as fast as the 145 with 3330s," the user said. "So we still have the upgrade potential of going to the 3330-type devices."

After careful evaluation of all the benchmarks, the company decided to go to dual Model 50s instead of going to the 370/145.

A later upgrade to a 360/65 is planned, with independent 3330s. The 65 will not only improve on the 145 but probably will have better throughput than the 155, the user said.

System	Peripherals	Operating Software	Time
360/50	Telex tapes, disks	Release 19.6 OS/MFT	1 hr 27 min
360/50	Same	Same with Hasp	1 hr 6 min
360/50	IBM tapes, disks	Same with Hasp	1 hr 17 min
360/65	Telex tapes, disks	Same with Hasp, all jobs in native core	48 min
360/65	IBM tapes, disks	Same with Hasp, all jobs on LCS storage Release 20.1 OS/MFT, split native and LCS	57 min 51 min
360/65	Telex tapes, disks	Release 19.6 OS/MFT with Hasp	49 min
370/155	IBM tapes, 2314 disks	Release 19.6 OS/MFT with Hasp	49 min
370/155	IBM 3330 disks	Release 10/1 OS/MVT	33 min

Chart 4. An additional group of tests was run using an abbreviated job mix on two partitions. Partition one included the file administration, stock status, and back-up files. Partition two included the MRP program, program testing, payroll and a data retrieval system.

System	Peripherals	Operating Software	Time
360/50	Telex tapes, disks	Release 20.6 OS/MFT	1 hr 58 min
360/65	Same	Same	1 hr 18 min
370/145	IBM 3330s	Same	1 hi 12 min
370/145	IBM 3330s, 2314 and tapes	OS/VS1 Virtual = Virtual	1 hr 3 min
370/145	Same	OS/VS1 Virtual = Real	1 hr 17 min
370/145	IBM 3330s, 2305, 2314 on IFA and tapes	OS/VS1	1 hr 3 min

Chart 3. The above results were obtained using the five-partition job mix in Chart 1.

Partition	Size	Software
1	40K	In-house "writer" called Modular Teleprocessing (Motel). Packs data for transmissions. Handles tape, disk and printing jobs.
2	60K	IBM's General Inquiry Control System (Gics) super-modified so IBM no longer supports it. Handles teleprocessing with 21 2780 terminals, and five 360/20s used as satellite CPUs.
3	60K	Gics used to control Bunker Ramo CRTs
4	140K-160K	Production jobs, file administration program, sorts and stock status.
5	140K-160K	Manufacturing Records Processing (MRP), applica- tion package not-supported by IBM.

Note: Jobs were run with the IBM Advanced Multiprogramming Analysis Procedure (Amap).

Chart 1. Mix of Jobs Run on Each Partition

# **Edos Helps Enhance Model 40**

(Continued from S/Page 1)

The total yearly savings resulting from the switch to a third-party Model 40 is estimated to be \$127,000, "and you hardly argue with those numbers," he added.

"And you also can't justify a 370 when you're looking at that kind of savings. The 370 would have increased our costs by about \$70,000/year," McBrien said.

Edos was hardly added into a simple operating environment, McBrien said. "We use almost all available programming languages including Cobol, PLI, RPG, Alogol and some TP work. So we had a real good mixture," he said.

Edos gives my batch-oriented shop all

Edos gives my batch-oriented shop all the operating advantages of OS without the tremendous cost of the core for the supervisor. We increased the supervisor by 2K to install the software, he said, but Edos operated with a 24K supervisor compared with a 92K supervisor for OS.

As an additional benefit, Media General plans to install the Edos spooling feature [CW, Jan. 24]

The spooling capability has been tested for some months at Media General and McBrien said he "will eliminate seven to nine hours of operations time each day." This means the company will eliminate an entire eight-hour labor shift," he said.

"We have proved in controlled tests that compilations can run 60% faster with the Edos spooling feature compared with direct printing under IBM's DOS," he said

McBrien said he "discarded" IBM's Power spooling package about two years ago "because of the size of the Power partition. It was going to have to be a 38K partition, while the Edos spooling utility operates in the minimum partition size of 16K

size of 16K.

"We intend to operate the spooling utility, which retrieves the output files from the disk buffer, in foreground 1 of system B which is really the fourth partition that the user can get under Edos, he said. So we will not take away from the major problem program partitions. We will run this as a subsidiary partition," he said.

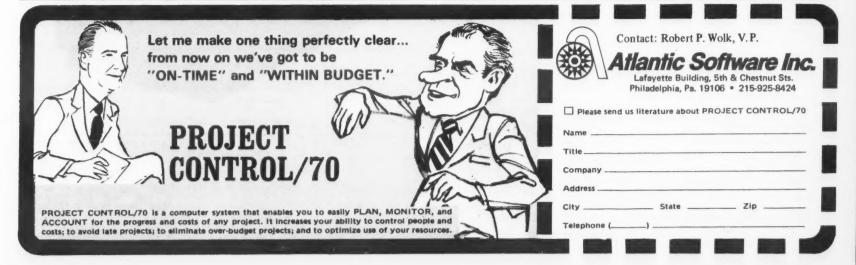
Media General uses its Model 40 to

Media General uses its Model 40 to publish a statistical reference publication called *Financial Weekly*. The publication is "totally produced" on the 360 in about three and a half hours for a "92-page paper that includes "semi-log graphs," McBrien said.

The Model 40 is connected to a Harris Intertype Fototronic/CRT which produces "totally paginated pages." The only thing not done is the pasting up of art work, he explained. The system sets type at a speed of about 2,000 char./sec, he said.

The extra time freed up by Edos has allowed the firm to shift all classified ad production away from "a series of minis" onto the Model 40. In addition more management reports, another publication and some experimental work can now be added to the 360, McBrien said. All this will be added while the work hours are reduced, he said.

"We would have been forced to go to a 370 without Edos. And now with spooling we really don't need a second CPU because we have enough available time," McBrien said.



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DETACH AND MAIL

#### **DOS Stabilization Helps**

# Independent Software Emphasizes Value of 360s

By Don Leavitt

Of the CW staff

For all the advances in hardware now available to the 360 user, it can still be justifiably argued that software is what makes the system work, and software is what is keeping users (especially those operating under DOS) linked to their equipment.

Ironically, perhaps the most important software announcement of the past year was not of a new product at all, but rather IBM's "functional stabilization" of DOS for the 360.

Some users thought this meant IBM was pulling the rug out from under their systems to get them to move up to OS (with its greater appetite for core) or to the 370 equipment

the 370 equipment.

In fact, it meant that IBM was doing exactly the opposite. IBM was renouncing its "right" to modify the basic system software any further, even if it felt a functional enhancement would be beneficial to the users. It was therefore saying to users and independent software houses alike, "OK, here is a firm base. Go ahead and build on it as you wish and we won't come along later to make your work redundant or inoperative."

Some vendors had foreseen that DOS would never develop in certain directions and had offered enhancements to the available system even before the "functional stabilization" announcement. Since the announcement, however, the number of packages has increased and the number of users of the packages has jumped even forter.

faster. More currently available enhancement packages offer a combination of features to extend IBM's DOS facilities — usually to make it more like the more complete Operating System (OS). The independents have worked to improve I/O speeds, to provide more effective program development tools, more effective system resource utilization and to give the user a better appreciation of what cost was incurred by individual jobs.

Efforts to improve the I/O speeds have generally centered around the concepts of spooling, or moving data destined for a relatively slow printer or punch to intermediate storage on disk or in core. Once that transfer takes place, the generating application program can immediately return to its processing.

IBM itself recognized the possible value of spooling and has long offered the Power spooling package without apparent cost to its users. Independents such as Boothe Computer note, however, that their spoolers use far less core than Power.

In many cases independent spoolers also allow the stored I/O data to be moved out to the appropriate peripheral when that device becomes available, while the application program continues execution. Some spoolers support shifting card images to disk for faster processing of input as well as output.

Independents have always been stronger

Independents have always been stronger than IBM in providing support for source program libraries under DOS, to eliminate unnecessary handling, and perhaps mishandling, of card decks.

Current library systems tend to go even further, allowing the storage of several identifiable versions of individual programs. And vendors have begun to stretch the basic program library concept to include languages other than just those provided by IBM.

Library support for Job Control Language (JCL) statements is also available from some vendors, again to provide the DOS user with the same "proc lib" type of facility IBM has included under OS for some time. Complete job streams can be cataloged and invoked later on demand.

Some of the packages support the creation of totally new job streams at execution time, by allowing the user to "pick and choose" then which of the

cataloged JCL statements he wishes to use.

The independent vendors have also

The independent vendors have also attacked one of the basic limitations of DOS/360: the fixed program partitions and the assignment of programs to specific partitions. Several packages work with the standard compilers or link-edit routines to store object programs in relocatable form with addresses that allow the programs to be used in any available partition.

partition.

Without this capability, users who foresaw the possibility of running a program in more than one partition had to store separate images of the program for each partitition, adding immensely to the disk space used by the libraries. With relocatability, a single image is moved into whatever partition is then available.

Still another facility many independents have included in their DOS enhancement packages, and which relates neatly to relocatability, is load balancing, whereby the system determines the most effective use of partitions regardless of what the user may have specified in his JCL statements.

One vendor, The Computer Company, attacked the partition problem from a different angle. With an option available

it to the users or independent vendors to capture these records and to summarize and report the accumulated data.

Several vendors answered this challenge and, in some cases, anticipated it by programming the complete accounting logic, from creation of the data records through report generation, without refer-

"Ironically, perhaps the most important software announcement of the past year was not a new product at all, but rather IBM's 'functional stabilization' of DOS for the 360."

under the company's Extended DOS (EDOS), users with enough core can have six partitions, instead of the normal maximum of three.

Job accounting, by which the computer itself reports how it is being utilized, came into its own in the past year or so. IBM included a module in DOS Release 25 to create accounting records, but left

ence to any coding provided by IBM.

While job accounting provides a means of billing user departments for system resources used in their behalf, another range of packages – program run-time analyses – enable the programmer to get a better picture of what his product was actually doing, and how it could be modified to do the job better.



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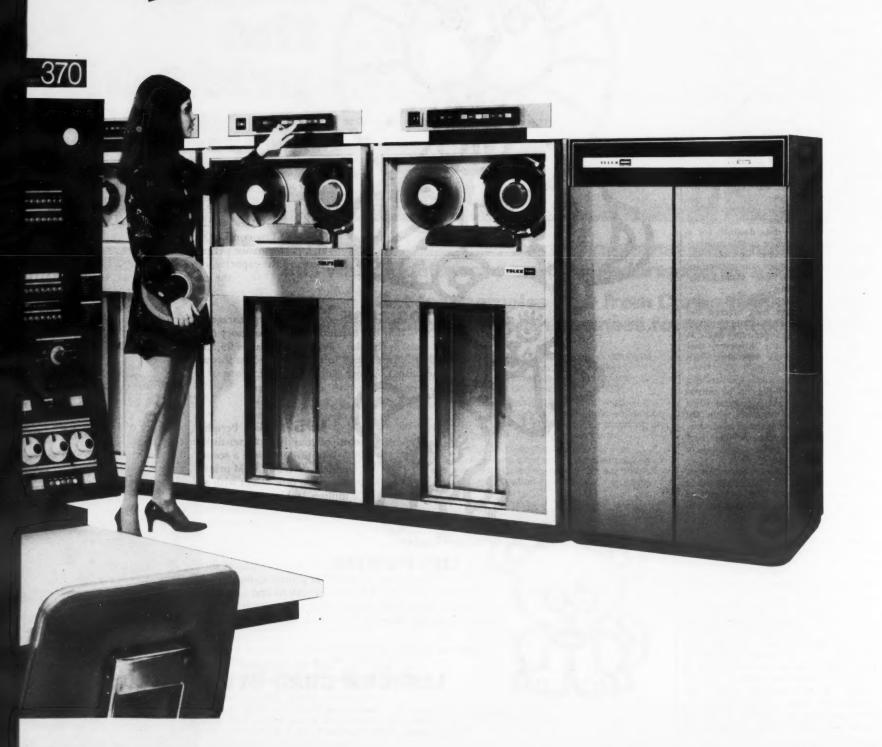
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# **Smaller 360s Are Not Forgotten**

ments for 360 systems are nothing new, most of the initial products concentrated on the "large ticket" systems such as the Model 50s and 65s.

But the enhancement suppliers now appear to be setting their sights downward to the smaller systems. One large group that vill undoubtedly benefit is the Model 30 users.

The 360/30 is not exactly a newer model in the 360 line. The first system was delivered in 1965. But the number of Model 30 users is large, probably the largest with the exception of the 360/20. According to figures compiled by International Data Corp., more than 4,780 Model are operating at users' installations.

More than 20% of these systems are on third-party lease with less than half on straight IBM rental. Presumably the remainder are purchased machines. But regardless of their origin, these users probably can expect increasing support from the independents.

One of the first Model 30 enhancements was the expansion of memory beyond rated IBM limits. And some users are pushing their systems to exotic mem-

ory sizes.
The Greyhound Computer Corp. data center in San Francisco has a Model 30 with 256K. This expansion has allowed the installation to operate in a partition environment using Grasp independent software and DOS.

With jobs such as sorts, the expanded system "has picked up about 18% to 20% in throughaccording to a Greyhound spokesman. This estimate was based on a "before and after" benchmark of one particular job. 'You can get longer strings in core and can do more core sorting than disk sorting," he said.

The Greyhound Model 30 includes one eight-spindle 2314 and five 2311s plus eight 2401-3 tape drives all on third party lease, the Greyhound spokesman

The large configuration has been operating for about six months and additional upgrades are being planned. The most important will be the installation of the new 360/30 accelerator [CW. Jan. 10] which will allow the 30 to operate with throughput similar to a Model 40, according to the developer, Computer Hardware Consultants and Services Inc. (CHCS).

#### **New Maintenance Problems?**

The accelerator feature promises to add some new dimensions to the already-sticky maintenance problem. When the inde-pendents began to push their add-on memories beyond the limits specified by IBM, the mainframer balked at maintain-ing such systems. And the accelerator, according to CHCS, will go even further to alter the microprogramming on the Model 30. What effect this will have on IBM's diagnostics and maintenance is not known.

But CHCS spokesmen are prepared to maintain these Model

#### **About the Editor**

This supplement was prepared under the direction of CW Technical News Editor Ronald A. Frank. Frank has also been responsible for the communications section since 1969.

Add-on Memory

#### Accelerator

#### Disk Devices

30s and anticipate that IBM will refuse to maintain even the 'native portions" of these CPUs.

Early in 1972 the Model 30 became the focus of a maintenance problem between IBM and Data Recall. The situation was apparently resolved when the independent modified some portions of its add-on configura-

At present IBM does maintain independently enhanced memories on 360s including the Model 30 but the decision is made on an individual basis for each installation.

Based on a judgment handed down by the U.S. District Court in California in March 1972, IBM will maintain "unaltered portions" of Model 30 CPUs on "best efforts" basis. This decision resulted from a suit brought by Itel and Advanced Memory

Systems Inc. against IBM.
While the court d While the court decision applied only to the two indepen(Continued from S/Page 11)

#### Want a Used 'New'

For users who want a "new" Model 30 from IBM the machines are available. While it is possible to order a 30, according to an IBM spokesman, the machine will not be new. cases, barring unacceptable independent enhancements, IBM will maintain these systems on an "as new" basis. For the customer this means the company will provide maintainence even though part of the system has been refurbished or replaced after being returned by another user.

At present, 16K and 24K Model 30s are available in six months while 32K and 64K configurations are supplied on an

'as available" basis, according to the IBM spokesman. An IBM spokesman said Model 30 "machines assembled from serviceable used parts and machines previously installed will at the time of shipment meet product functional specifications currently applicable to new machines." And this includes the one-year warranty normally provided for new equipment, he

Officially, IBM supplies Model 30 configurations up to 64K with 96K available on a Request for Price Quotation (RPQ)



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proving to be the best. Users are saving money because throughput is dramatically increased. Operators take to the DATA/SCOPE like it was deils on insta There your make it eas

# Smaller 360s Aren't Being Forgotten

(Continued from S/Page 10) dents involved, it apparently applies to other independent equipment as well. IBM will not comment on a blanket policy for providing maintenance to independently enhanced Model 30s, but says each case is decided separately.

#### 3330-Type Device

Another potentially interesting Model 30 enhancement is the addition of a 3330-type device. While some experts argue that this type of device is too fast to be supported by a Model 30 processor, others see a buffer device being introduced by an

independent supplier.

A buffered controller for the Models 30, 40 and 50 was announced last year by Computer Investors Group. Production of this device, to be handled by International Peripherals and Computer Corp., has apparently been delayed until later this year, according to a CIG spokesman.

If the buffer principle works, the addition of a 3330-type unit would further enhance the 30 to a point where an upgrade to a comparable 370 such as the 125 would become less appealing to users.

One midwest DP manager

facing the 30 versus 125 decision sees very little contest between the two systems. He now pays \$4,800/mo for his Model 30. To "upgrade" to a similar 125 with independent peripherals would cost at least \$8,000/mo, he estimated.

The user is planning to carefully evaluate the performance of a 30 with expanded memory and other independent options. "With this type of price spread, I can afford a lot of enhancements before the 30 becomes as expensive as the 125," he said. And by enhancing the 360, he feels he can equal the capabilities of the 125 at greatly reduced cost.

#### How the Accelerator Rates

IBM 360/30	IBM 360/40	CHCS Accelerator 30		
1 byte	2 bytes	2 bytes		
1.5 µsec	2.5 µsec	1.5 µsec		

Chart compares the performances of the IBM Model 30 and Model 40 with the CHCS accelerator-equipped Model 30.

OP Code	Code	360/30	Accelerator 30
Load	58	24 µsec	16.5 µsec
Store	50	24 µsec	16.5 µsec
Load Multiple	98	206 µsec	105 µsec
Add	5A	29 µsec	22 µsec
Load Register	18	17 µsec	9 µsec

Some instructions execute almost twice as fast when run on a system using the accelerator feature. The chart compares the IBM 360/30 timings with similar instructions run with the accelerator.



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## Accelerated 30 Should Handle Medium-Size Nets

Of the CW Staff
NEWTOWN, Pa. - The accelerated Model 30 introduced by Computer Hardware Consultants & Services Inc. (CHCS) [CW, Jan. 10] should be able to handle the throughput of many Model 40 systems. It will be able to handle medium-size telecom-munications networks efficiently and provide a surprisingly high price/performance ratio.

These conclusions are based on the preliminary results of the first tests of the accelerated system in operational environments. The tests are currently being conducted by Marc Reid-

stein of Trilog Associates Inc.
Particularly important in the Model 30 modifications being tested was their impact on Model 30-powered telecommunication networks. Until now the Model 30 has not been used in medium-load telecommunication systems being run on top of batch processing.

The software simulation microprogramming used in the stan-dard Model 30 for handling such operations was designed for low loads, and so has a high inter-ference rate. (It takes around 80 machine cycles on the standard system to handle each single byte being transmitted, so the increase in use of these systems can interfere seriously with the operations in a batch partition.)

The CHCS improvements have concentrated on reducing this interference, and so increasing the capacity of the accelerated system to handle network loadings without having to move to the considerably more expensive

#### IBM Said to OK Off-Line Switch

Some of the independent suppliers have tried to ease the maintenance problem by pro-viding special exclusion features that will "lock out" the independent memory. The effect of such or unaltered" portion look like an all-IBM system. And the theory is that IBM will maintain such CPUs where non-IBM parts have been switched out.

One of the more recent switch arrangements was announced by Computer Hardware Consultants & Services Inc. (CHCS) which the company says "permits IBM maintenance of highly upgraded" Model 30s under "standard agreements."

The "off-line switch" which

CHCS says has been approved by IBM, "electronically negates alterations to Model 30 computer systems that expand core memory up to 256K. By throwing this switch the IBM Cus-tomer Engineer isolates the Model 30 from the CHCS add-on core . . . and this allows IBM to run standard diagnostic mainte-nance checks," according to CHCS.

After inspecting one of the CHCS Model 30 installations with the switch, IBM wrote the independent supplier that "it is practical for IBM Customer Engineers to maintain the unaltered portion of the IBM 2030 [CPU] under our standard maintenance agreement."

Similar installations would be eligible for IBM maintenance on their unaltered portions, the letter said.

Model 40 or 125 systems

The first tests were designed to make throughput comparisons of the accelerated Model 30 and unchanged Model 30 and 40

The tests were designed to get a handle on both full OS per-formance and DOS performance. In each case Reidstein elected to concentrate upon one processordominated program and one I/O concentrated program.

The I/O jobs selected were the disk sorts under both DOS and OS. These were checked on a 100,000-record file of variable length records averaging 20 bytes each.

The record ID and the record length were chosen as keys to provide for a randomized distribution of records. The DOS system with its lower overheads I/O area showed strength by sorting the file in 12 minutes, while the OS system took 16 minutes to complete the

After watching the operation, Reidstein said he anticipated the accelerated system would show marked improvement over the standard Model 30, even though the I/O loads were predominant

during most of the job.
"The first phase," he explained, "is concerned with an

internal sort which really uses the processor. I was watching the wait light, and it hardly flickered at all until after the phase was completed, so the pro-cessor was flat out. This must have improved the performance by comparison with the standard model," he said.

It illustrated, he commented, that even programs such as sorts, which were often thought to be I/O bound, did in fact have processor involvement which could be improved without any I/O changes.

No tests were done on the use of remote networks. Reidstein believes, however, the improved



Changes to the Model 30 stanmicroprogramming card deck are entered with modified

performance of the accelerated Model 30 in the telecommunications area can be forecast with reasonable confidence, owing to the use of heavy I/O command structures in the sorting tests.



## Will Lightning Strike the 'Free Soul'?

# Secret Fear Stalks Those Who Would 'Mix'

360 system is invariably based on a third party leasing arrange-ment and/or the use of indepen-

dent peripherals.
While most users are very much aware of the significant savings that can be obtained with a shift from IBM to independent equipment, relatively few users have made such a shift.

The hesitancy on the part of users is to a large degree based on an unwritten fear that light-ning will strike the mixed system site while virtue will prevail for

Industry experts estimate only 12% of U.S. users are innovative enough to take the plunge and use some sort of non-IBM equipment. And with few exceptions these users not only save 20% to each month but they get maintenance and other support which is at least as good as that provided by IBM.

Users considering the installation of an independent disk or other peripheral system often hear "horror stories" about systems that crashed or files that

tomer put his destiny in the hands of an independent sup-plier. Few of these stories are ever verified, probably because names are rarely used and sites never identified.

The users who seriously consider independent equipment insist on a list of names of others who have installed the same type of peripherals. Many independent suppliers readily provide this data to prospective cus-

Still the aura of IBM ownership

pervades many DP installations. "We thought about an indepen-dent disk system," one user said, "but the IBM CE just shrugged his shoulders." The user ex-plained that this action on the part of the IBM representative had led to much soul searching with the subsequent decision not to contract for the independent

most cases the IBM man doesn't say anything against the proposed independent equip-ment. Merely the shrug of a shoulder or a similar implication

equipment.

"IBM is learning to accept independent competition." - a mixed-system user.

is enough to give the DP manager visions of an IBM maintenance man refusing to answer a repair call or some other horrible fate which never materializes.

Satisfied independent equipment users look back on their all-IBM days and wonder why they didn't take the plunge earlier. And in most cases users find IBM's support changes very little when independent peripherals are introduced.

Especially in the area of 360 enhancements, the independents have provided users with fea-tures not available from IBM. The trend probably began with the add-on memory products that eventually allowed users to expand their mainframe systems beyond the rated memory capacity advertised by IBM.

Some maintenance problems did develop in this area but in each case where IBM threatened to withdraw maintenance, the independent supplier offered an alternative to the user. Eventually IBM conceded that independently enhanced mainframes could be supported.

Another innovative area pioneered by the independents involves the 3330-type disk system. Several yendors now allow

tem. Several vendors now allow the user to attach this faster disk to the Model 50 and 65.

Even the often expressed fear of "how long will the supplier be in business" has proven groundless. In the few instances where firms actually ceased to provide a certain type of equipment, almaintenance sources ternative were provided.

For some users, again the in-novative ones, the third party maintenance firms have provided high quality support at signifi-cant savings. True, IBM 360 maintenance is only about 3% of the total system cost but even a small savings is a dollar "earned" for most users.

Many installations get their first experience with third party maintenance when they acquire an independent terminal or mainframe peripheral. After they discover that the mainte-nance company understands the equipment and its representatives are qualified to keep the units in running order, they may expand their non-IBM maintenance until an entire site is being supported by independent

"IBM is learning to accept in-dependent competition. They are reacting in a competitive manner by trying harder to please the customer," one mixed system user said, "and that is an important development that will benefit all DP sites."



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# Independent Disk, Cache Memory Due for 65 Users

# 3330-, 2305-Type Devices Scheduled

Among the more significant 360 enhancements scheduled for this year by the independent suppliers is the addition of 3330- and 2305-type devices to the IBM 360 Model 65. The addition of a 3330-type disk to a 360 is limited to the Model 65 and is available only from independent suppliers.

Itel has already delivered several of its 7330 disks with its 7830 controller and Ampex said it is working to install a similar unit.

#### **Attractive Options**

The Itel system offers users some interesting options. Using an Itel controller to attach a 3330-type disk allows the user to also attach a faster 2305-type device with the same controller. On the other hand, IBM systems using these disks require a

separate controller for each device.

The Model 65 can handle a transfer rate up to 1.3 Mbyte so "any fixed-head device that does not exceed this rate can be attached," an Itel spokesman said. The Itel 7305 has a transfer rate of .9 Mbyte and thus falls within the limits of the 65.

The IBM 2305 units, however, with transfer rates of 1.5 Mbyte and 3 Mbyte are beyond the capacity of the 65, the spokesman explained.

#### Another Trade-Off

The Itel 2305 equivalent will not be available until later this year, but in the meantime the company offered users another interesting trade-off to consider.

The 3330 and 2305 equivalents on the Model 65 can be attached in two ways. The independent units can attach directly to the CPU's 2860 selector channel or they can be attached using a special block multiplexer device.

While the selector channel approach is

considered to be a plug-to-plug modification, some OS software changes are required on the 360/65, according to Itel. The basic software changes give the system Rotational Position Sensing (RPS) capabilities with both the 7305 and the 7330, the spokesman said.

For users who find the software changes distasteful, Itel's block multiplexer device will allow direct attachment of both 3330- and 2305-equivalent systems. The block multiplexer feature may include an "upgrade kit" for users who have a 2860 channel. This kit would allow these users to upgrade the block multiplexer to the capabilities of the 2880 channel, the Itel spokesman said.

While the selector versus block multiplexer trade-off is different from a configuration standpoint, the Model 65 will look the same to the user, Itel said. "From the standpoint of walking up and running a job on the CPU there would be no difference in job control or operational procedure," the spokesman said.

## Ampex ECM Goes Beyond IBM 2361

Most independent memory add-on products for the 360 are basically a "one generation" enhancement. Although additional increments of memory can be added one on top of the other, they usually don't improve on the capabilities of the earlier memories.

In cases where independents have come out with faster semiconductor enhancements, the earlier core add-ons continue to operate at their slower speeds. The user would have to trade in the slower unit to enjoy the faster operation.

But one independent has found a way to speed up a previously-installed memory enhancement. The Mainframe-ECM memory is offered by Ampex for users of the Models 65, 67 and 75 who already have the company's Extended Core Memory (ECM).

The Mainframe-ECM is a semiconductor cache memory that operates at 250 nsec and is available in a 32K byte size for each Mbyte of ECM.

The ECM alone, although a replacement system for the IBM 2361, surpasses the capabilities of the IBM system. And when the cache feature is combined with the ECM, the effective speed of the 360 memory is increased to 750 nsec which matches the speed of IBM's 2365 memory, according to Ampex. This compares with a 1.8 sec speed on the ECM-only system, according to Tom Harleman, marketing manager at Ampex.

The cache, used in conjunction with the ECM, allows users to expand their 360s up to 8M bytes using the IBM 8080 adapter. This compares with the earlier limit of 2M bytes with the core-only ECM, Harleman said.

For less than a 20% increase in price,

For less than a 20% increase in price, the 360 user will significantly increase the throughput of his system, he claimed. While users can decide how much additional memory they need, up to the 8M byte limit, Ampex said less than 1M byte expansions would probably not be worthwhile.

"We feel the user can easily go down to 256K of native memory on the 65," Harleman said, "and then add the cache and an ECM and get the equivalent of 1.25 million bytes." Or the user can add a 2M byte ECM and get the equivalent of 2.25 million bytes, he added.

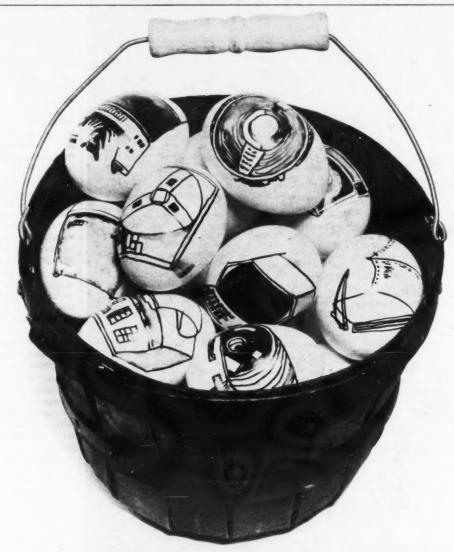
The Ampex cache is very similar to the cache memory on the 370/155, according to Harleman. The high-speed cache together with the slower speed main memory serves to increase the overall throughput of the system.

The Ampex ECM-cache combination is scheduled to be available in "late spring," the company said. A 1M byte add-on lease will cost \$8,000/mo on a two-year contract with maintenance and the same system will sell for \$250,000.

Comparable mainframe memories from IBM and other suppliers lease for \$12,000 to \$36,000/mo and sell for \$500,000 to \$1.5 million, an Ampex spokesman said.



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# Computer Sharing Cuts Costs for Model 30

For users who cannot justify the financial cost of an in-house 360 installation, one supplier has a different solution.

"We call it computer sharing," said Ken Ball, director of marketing for Grey-hound Computer Corp., "and we use the concept to marry together similar users.'

The Greyhound approach allows a company to install a system such as a 360/30 share the available resources with

Life of 360 Set At 10 Years

While no one can predict exactly how long the 360s will continue to be an effective system for users, few appear ready to call the IBM family obsolete.

One independent supplier, DPF Inc., is planning a 10-year program to support 360 users with enhancements products for their systems. These enhancements will give the user greater productivity from his CPU, according to Michael Creedon, vice-president and national sales manager.

Included in the products DPF intends to offer are expected additions such as core,

but some unusual ones are also planned.
"We're looking at attaching 3705-type devices to the 360," he said. The 3705 is a programmable front-end scheduled for first deliveries this year. The processor is an upgrade for IBM's 270X family of line controllers, and offers many of the characteristics pioneered by the independent front-end suppliers.

While primarily useful "for the higher end" 360s, Creedon said DPF will also offer the 3705-type unit down to the 360/40.

The independent supplier also expects to offer a non-IBM 3330-type disk system for the 360/50 and 65 and "to a certain degree on the Model 40."

And the firm expects to provide communications users with an independent equivalent of IBM's 270X line controllers, he added.

#### Eye on Software

In the software area, operating system enhancements will be available for 360 users, Creedon said. While the third party leasing companies have mostly concentrated on hardware, DPF will increase ingly turn its attention to systems and software support using non-IBM programs, he said.

"As part of our 10-year plan, we realize the user will need support in non-hardware areas," he said. "We have to be able to assist the user in utilizing the

equipment," he added.
"We're looking at the 360 now as an

economic tool that can be used to achieve certain throughput," Creedon said.

Another independent that feels it can supply a special capability to 360 users is Fabri-Tek Inc. For users with Model 65s with 1M byte of storage, the company can add core memory "at the end of the feature wall," according to Ken Geason, director of end user marketing.

If the user has four IBM 2365-2 memory modules or independent equivalents, Fabri-Tek can expand the system to 4M bytes. Without the add-on capability the customer would have to eliminate of his 2365-2s to "make a port available,"

Geason said. While there are a "number of indepenwho have expanded 65s beyond 1M byte, none have used the Fabri-Tek approach, Geason said. This capability is especially meaningful for the customer who has purchased his 360/65.

"This user would be really trapped un-less he sold one or more of his 2365

memory modules, Geason added. The Fabritek core costs about 25% to 30% of IBM's equivalent units, he said. This means a 70% savings in addition to the unusual expansion feature, he added. The first 65 memory, called 65+, was

installed last spring.

"Most systems are used less than 180 hr/mo, Ball said. So in any given month as many as 744 hours can be allocated to outside users, he estimated. "It would not be in IBM's interest to put several users on one system," Ball said, "but we feel there is only a limited amount of 360 processing power available and it should be used in the best way possible."

#### Costs Shared, Too

For the host user who agrees to have Greyhound find other users for his system, there can be financial benefits. "Suppose IBM supplies a Model 30 for \$10,000/mo and we can supply the same machine for \$6,000/mo," Ball said.

"If the host user needs 200 hr/mo and we contract to have an outside user utilize 50 hr/mo, the host user will pay only 75% of the monthly charge for the system."

As more outside time is allocated on the system, the cost to the host user drops proportionately, Ball said.

At present, about six users have taken advantage of the computer-sharing concept, he estimated. The principle can work for batch users who require physical access to a system or it could be applied to several users connected to a CPU through data lines, Ball said.

For variation, Ball believes more than two users could share a system as long as their processing requirements were met. In addition, the CPU need not be installed at the host user's site. "The Model 30 could reside at one of our data centers," Ball said. And such a move could help to expedite system maintenance by making the system more accessible, he

#### System Support

One of the user benefits of the Grevhound sharing scheme is that the company can provide the system support that often is very important to the smaller user, according to Paul LeClair, producmanager of Greyhound's San Francisco data center.

"Actually the shared installation becomes an extension of our own data center," LeClair said. He cited one example where a shared CPU was located closer to a potential user than the data center. "He needed some time so we provided him with resources that the host user did not need," he said.

Obviously Greyhound will not find

users to share the host machine without a charge. If the company agrees to contract for a block of hours on the host user's machine, the first hours pay Greyhound's costs and then the host user begins to get a direct reduction off his monthly rental

In some ways the company may find itself competing with the host user for customers, but the relationship can also benefit both parties. LeClair cited one instance when the data center could not provide the time desired by a customer who needed time.

"We sent him over to a shared 30 system so we kept our customer happy and at the same time decreased the monthly cost for the host user," he said.



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# Users Keep 360s 370 Performance Often Less Than Expected

360 are not always tied exclusively to cost. While most users feel the savings are important, many are also disappointed with the relatively small performance improvement they can get with a 370 upgrade. This increased operation, which often falls short of IBM's claims, has to be acquired at a high upgrade price, these users say.

"The reason for staying with 360s is that the 370s are so much more expensive than we feel is warranted. Our benchmarks have not satisfied us that the performance claimed for the 370s is worth the additional cost," according to Phil Wanglan, viceat Chicago's Central National Bank.

"We felt we could afford just

an increased basis to IBM every year and after that it becomes prohibitive," he said.
"We have had third-party leases

for the past two years and some

to come up with a 1.5 increase in performance we had to go to a 384K 145. And this 370 was dramatically higher in price," he

"The reason for staying with 360s is that the 370s are so much more expensive than we feel is warranted. Our benchmarks have not satisfied us that the performance claimed for the 370s is worth the additional cost." - a user

of the IBM peripherals are under full two-year leasing to hold those costs down. And we are not dissatisfied with OS performance on the 360/50s," Wanglan said.

"IBM was talking about a 1.9 to 2.2 increase in performance by going to the 145 from the 50. This was on a 256K Model 50

"We didn't feel that the price gap which was in the six figures per year warranted getting only a 50% throughput or a 1.5 increase. This became more dra-matic when we found we could lease Model 50s with 512K for about 48% of the list price," Wanglan said.

"There is very little 370 third-

attractive discount, within a reasonable time frame," he added.

For the 360s the bank could get a good discount and sign up

for only 12 months, he said, and this still left room for upgrades within a short time.

Current third-party lease prices are about 55% of IBM list for 90-day cancellation privileges, and 48% of list for a 12-month commitment, he said. This includes the option of a nopenalty upgrade as long as the customer stays with the same lessor, he said.

But Wanglan thinks he will be

forced into a 370 by 1974 because IBM will probably drop OS support for 360 users. By the end of 1973 users will have to pay for OS support, he pre-dicted. "We know that all of the 360 peripherals are no longer in manufacture; they are rehabbed machines," he said.
"So into 1974 IBM will do a

good job of constraining the desirability of staying with 360s

much longer," he said.

While Wanglan said he has some 370 orders with IBM, he would not rule out other alternatives if they were financially attractive.

The bank now has dual 512K Model 50s but the second is required for backup. One 360/50, at 48% of IBM list, with 512K, cannot be duplicated with a similar 145, Wanglan said. "We would instead have to go to a 155 or a 158 and the cost spread would be phenomenal. You would be talking about a quarter of a million dollars per year," he

At Chrysler's Airtemp Division IBM had installed a 370/155 but the firm decided to look around for some way to cut costs. The best way seemed to be with a third-party lease," said Lynn McKinley, DP manager.

"We found that a 360/65 with independent 3330-equivalent disk drives was the best thing that we could get," he said. "We benchmarked 2314 disks on both the 65 and 155 and found the 65 outperformed the 370. the 65 outperformed the 370. We felt the 65 would be at least equivalent with the 3330-type drives," he said.

McKinley expected some degradation with the 3330-type units on the 768K 65 because the system "would lose the block-multiplexer function." But if the block-multiplexer fea ture is also added to the Model 65, as announced by some of the independents, it will be "an extremely fast machine," he said.

"We have been running for two we have been running for two weeks with the 65 and we haven't noticed any deteriora-tion in throughput," McKinley said. Chrysler runs "every type of application" including invencontrol, production con-finance, sales, personnel and industrial engineering jobs, he said. "And there has not been a noticeable degradation anywhere," he said.

The company has Itel 7330 disks and IBM 3420 tape drives with the system on third-party lease. The IBM 155 was "the equivalent of what we have on the 65," McKinley said.

The savings enjoyed by switching to the 65 will be "between \$270,000 and \$300,000 per

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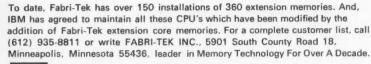












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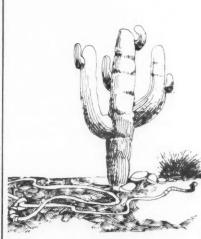
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#### Two Users Agree:

# 360/50 Better Price/Performer Than 145

By E. Drake Lundell Jr.

Of the CW Staff
If a 370/145 offers users a 50% throughput increase for just a 4% increase in price compared to a 360/50, why are several users finding the 360 unit a more effective price/performer?

The answer is simple: They are comparing leased 360/50s against 370s rented directly from IBM but the prices of the 50s offered by third-party leasing companies can change the equation completely.

Keydata Corp., Wate Mass., found the 145 better throughput per Watertown, better throughput performer than the 50 by about 50%. And in terms of IBM prices for the two systems, it was only 4% more expensive, obviously a better deal on a price/performance basis.

But Keydata looked around to see what type of deal they could get on a 360/50 from the thirdparty leasing companies and found that Itel was offering the system at between 50% and 65% of the original IBM rate.

If the 145 gives a 50% better performance for about the same price, the price/performance ratio is 3 to 2 in favor of the 145, according to John Hermistone, general manager for computer operations at Keydata.

But since the third-party lease rates have fallen to around 50% of the rental rates from IBM, it of the rental rates from IBM, it is now possible to get two 50s for the price of one 145.

This tips the price/performance ratio to 4 to 3 in favor of the

Hermistone explained, and in addition gives the user some benefits not available with the

one system shop.

The greatest additional benefit is backup, he noted. If one system is down the user can still operate on the second – operate at a reduced level, of course, but still remain on the air.

Another advantage is that there are no overtime charges when the systems are leased from third-party firms, he said. Keydata was paying approximately \$3,000/mo in overtime charges to IBM with the 145.

In fact, a leasing company ex-cutive claims, "we have been ecutive claims, able to prove in the majority of cases that a 50 leased from a third party is a 20% to 25% better price/performer than the 145," even before the overtime charges are figured into the equation.

At Keydata, which went from one 145 to one 50 with plans to upgrade to two 50s, the savings amounted to around \$108,000/

Another user who made the same evaluation is Golden 50

which replaced one 370/145 with two 360/50s for about the same price

On a price/performance basis "we're ahead of the game," Joe Lavin, director of DP, said in discussing the move.

Before the switch, the firm was operating one leased 50 and a 145 rented directly from IBM.

The cost of the 262K 145 alone was averaging around \$18,000/mo, Lavin said.

Golden 50 threw out the 145 and got another 50 and now the total cost for the two leased 50s is just under \$20,000/mo - just over the cost for the 145 alone, he noted.

Lavin admitted the 370/145 was a better performer—
"definitely faster"—than any single 50, but said on a price/performance basis the single 145 could not touch the performance of two 360/50s for approximately the same monthly

Golden 50 is also saving in overtime charges, Lavin noted.



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That's just the overview. Why don't you get the whole story by writing or calling Neal Wilder or Dottie Travis (617) 332-5606. They'll be glad to send you a copy

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# University Discovers Third-Party Hardware Reduces Budget by 4 %

By Michael Weinstein

Of the CW Staff
LAS CRUCES, N.M. — A saturated system and a school administration which would not allocate extra money for an upgrade led Mike Mann and the New Mexico State University computer center to investigate the "IBM-multivendor-third party world" with surprising and gratifying results.

ing results.

From this search they were able to obtain a 300% increase in throughput while reducing the hardware budget by Act.

The initial system was a 360/50 with 256K bytes of main memory and 1M byte of large core storage (LCS) operated under OS/MVT with HASP, Mann said.

In this particular environment, the operating system required over half of the high-speed core while one teleprocessing system (APL) took the rest.

Thus, at least while APL was running, all batch jobs were run in LCS — which led many to comment that New Mexico State had the largest, most expensive Model 50 in the West, Mann noted. However, he said, the Model 50 proved

However, he said, the Model 50 proved to be a sound choice in many respects; it performed reliably and satisfied requirements very well — to a point. That point was saturation, which occurred for an extended period during the spring of 1971.

Studies and evaluations indicated an upgrade was essential. For all practical purposes, Mann noted, the massive problems presented by conversion to any other manufacturer dictated the upgrade be limited to IBM systems.

be limited to IBM systems.

From this premise, three alternatives were considered: enhancement of the Model 50; move to a 360/65; or upgrade to a 370/155.

Mann decided to test the university administration's willingness to commit additional funds — \$90,000 — to permit acquisition of the 360/65. However, subsequent discussion of belt-tightening and extending the life of the current machine resulted in no additional hardware funds for new systems.

During the summer of 1971, the five alternatives outlined were reconsidered, with the view toward purchase as a means of lowering cost, Mann said.

Preliminary discussions with third-party leasing and brokerage concerns were initiated. It was discovered that an IBM 360/65 system could be obtained from any of several third parties for about 50% to 60% of IBM's commercial price.

any of several third parties for about 50% to 60% of IBM's commercial price.
Discussions were also held with an outside vendor who could provide add-on memory, disk and tape units with considerable timing improvements over comparable IBM units. And all of these units would more than justify a resident customer engineer, Mann noted.

In 1971 the university put out a request for bids which was separated into two

• A request for bids specifically for an IBM 360/65 CPU, 256K main memory, two (or more) selector channels, a multiplexer channel, and a console unit.

plexer channel, and a console unit.

• A request for bids for auxiliary memory, disks and magnetic tape units satisfying certain minimum criteria and insisting that all items be supplied by the same vendor.

The low bidder on Part 1 offered an IBM 360/65 at 38% of IBM rental cost with all installation, shipping, cables and insurance included in the price.

The system also included three selector channels, two selector subchannels on the multiplexer channel and an 8080 adapter – for the independent's add-on memory.

memory.

The low bidder on Part 2 was Ampex, who presented figures offering 2M bytes of Extended Core Memory (ECM), two disk controllers and 12 spindles, and one tape controller and two disk drives at a price just over 50% of standard IBM

one-year rental rates, Mann said.

When the two bids were combined, with the maintenance and tax figures included, it was discovered that the complete system could be obtained for some \$18,000 less than the price tag of the current Model 50.

With 2M bytes of 1.8 msec core interleaved to give an effective cycle time of about 1.4 msec, Mann estimated that the proposed system would provide a throughput improvement of at least 300%.

The money saved provided for one further upgrade – the addition of a second line printer and card reader for

At the same time the current card reader, printer, controller and two communications controllers were purchased from IBM, Mann stated.

A competitive summary of the old system and the new, along with the total annual cost of each is presented in table

Old System	New System	
IBM 360/50, 256K	IBM 360/65, 256K	-
1M bytes IBM LCS	2M bytes Ampex ECM	
(8 μsec)	(1.4 µsec interleaved)	
12 2314 disk spindles	12 Ampex disk spindles	
(60 µsec average access)	(30 µsec average access)	
2 IBM magnetic tape units	2 Ampex tape drives	
(60K bytes)	(60K or 120K bytes)	
2 selector channels	3 selector channels	
l multiplexer channel	1 multiplexer channel	
	2 selector subchannels	
1 1403 printer	2 1430 printers	
1 2540 card reader punch	1 2540 card reader punch	
	1 2502 card reader	
1 2821 control unit	2 2821 control units	
1 console unit	1 console unit	
Total annual cost: \$345,500	Total annual cost: \$332,900	

Table 1. Comparison of the Old System With the New Multivendor System

2, also compiled by Cartlidge.

The financial advantages possible with a multivendor system are now obvious, Mann said. Many of the operational problems have been resolved and much valuable experience has been gained. The installation which considers moving to such a configuration should be informed and prepared to meet added stresses in exchange for an improved price/performance ratio, he concluded.

A full description of the New Mexico State experience will soon be available in printed form and can be obtained by writing to Bruce Ramsey, P.O. Box 732, Gaithersburg, Md.

Requests should be made for the paper "Financial and Operational Aspects of a Multivendor Installation in a Nonmetropolitan Area" incorporated in the proceedings of the 3rd Annual Sigcosim Symposium.

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# Bits & Pieces

# Input to Key-to-Tape

Unit Done by Selectric
PLAINVIEW, N.Y. – A key-to-cassette system provides full teletypewriter signal capability and outputs keyboard data from an IBM Selectric directly onto a

magnetic tape cassette, according to the developer, Varisystems Corp.

Designed as an alternative to punched paper tape, the "Reporter" eliminates the need for keypunching, tape tearing, chadding, spooling and other activities nor-mally associated with paper tape, the

firm's spokesman said.

The tape drive controls a 200-foot magnetic tape cassette which can store up to 645K bits of data each, in blocked format up to 256 characters. Tape speed averages 31 in./sec, the spokesman said.

Special command keys on the Selectric enable the operator to output codes used on- or off-line to drive peripherals, central processors or phototypesetting equipment, the spokesman added.

Cost of the system is \$3,470 with deliv-

ery in 60 days from 207 Newtown Road,

#### Peripherals for PDP-8 Users

MAYNARD, Mass. – Digital Equipment Corp. is offering PDP-8 users a new logic module designed to interface equipment such as A/D converters, instruments, read-only memories and arithmetic/logic units to minicomputers equipped with the Omnibus bidirectional synchronous

The M1709 Omnibus Interface Foundation Module provides all required Omnibus interface logic – device selectors, bus drivers/receivers and interrupt/skip circuitry, the firm's spokesman said. Price is \$125 with delivery off-the-shelf.

#### HP Users Offered Add-On Core

SUNNYVALE, Calif. – Hewlett-Packard 2100 Series computers can now be expanded to 32K core with Daconics' 2970 core memory add-on subsystem, according to the developer.

The memory requires no hardware changes to the CPU and works with the existing installed core to offer a memory access time of 250 nsec, the firm's spokesman said.

A self-contained power supply conserves CPU power for peripheral I/O controllers and all existing software.

An 8K add-on costs \$4,400, with the

16K add-on selling for \$7,700 from 925 Thompson Pl., 94086.

#### **Unit Rewinds Paper Tape**

HIGHLAND PARK, Ill. – The TM/270 is a paper tape winder which collects tape that is being expelled from readers and punches at rates up to 115 char./sec or 11-1/2 in./sec, according to the developer Data Specialists Inc. oper, Data Specialists, Inc.

Price is \$90 from 1548 Old Skokie Rd., 60035

# Minicomputer Allows PL/I Programming

NEW YORK - Q1 Corp. has a desk-top minicomputer costing around \$20,000 which features a PL/I language capability.

The Q1/T is available in 4K-, 8K-, 12K-and 16K-byte configurations with the PL/I compiler requiring about 8K bytes - of which 5K are resident, a firm

spokesman said.

The other language offered, a system assembler, can be linked to PL/I programs so assembler code can be used as sub-

routines, he asserted.

The present storage medium is special magnetic cards which are inserted into the

hold 64 tracks - 160 char./track - of data for a total of 10K byte/card which can be accessed by programs, the spokes-

A disk subsystem for larger storage, the

spokesman said, will soon be released.
Output from the system is via a 30 char./sec printer that incorporates proportional spacing and offers users upper-and lower-case options with a 158-character total capability, the spokesman

Since the printer also has forward and reverse capabilities, it can be used as a plotting unit, he added.

Included in the keyboard entry console is an electronic display with 80 character display positions. This display is used to visually edit and correct programs or data, the spokesman stated.

In many cases the Q1/T provides faster response than larger, batch-oriented machines, such as the IBM 360/30 and

System/3, since card punching and sequential tape storage are eliminated, the spokesman asserted.

The Q1/T is specifically aimed at commercial data processing and text-processing users with applications such as order, entry, inventory, receivables, pay-ables and general ledger, the spokesman

In programming a typical business application – such as payroll – the use of PL/I permits a reduction of up to 90% in programming cost, compared to machine language, the spokesman

Q1 Corp. will provide users with application and operating software as well as provide personnel training programs and operating aids, for the Q1/T, the spokesman stated.

Future enhancements include a mag tape system so that Q1/T output can be transferred and used by larger processors, and a 64K byte version of the systom.

# **Future System** Design Possible With Switch

By Michael Weinstein

Of the CW Staff
ZURICH, Switzerland – IBM scientists have unwrapped an experimental switching device that is reportedly much faster – by a factor of at least 20 – than experimental transistors and requires only bout 1/10,000 of the power.

The importance of this development to

the computer user, an IBM spokesman said, is that a technology now exists to allow central processors to operate much faster than previously defined limits.

The device can be switched in less than 10 trillionths of a second (picoseconds), the spokesman said.

#### **Time's Winged Chariot**

The speed of the new device can be envisioned, the spokesman continued, by

# Looking Ahead

noting there are about as many picoseconds in a second as there are seconds in 30,000 years.

The very low power required by the new switch means it generates little heat and thus the switches can be packed closely together to take full advantage of their speed, the spokesman asserted.

Since an electrical pulse travels about a millimeter in the time the IBM device switches, very dense packaging is essential to avoid excessive delays as signals travel

from one circuit to the next, he said.

If this switching device were to be used in computers under its present design, it would be necessary to enclose the switches away from the CPU in a helium refrigeration unit, the spokesman noted.

While this presents some disadvantages. he felt the potentials of the new switches more than offset them.

Further, the spokesman stated, the technology to enclose the switches is presently available.

# Small Calculators Add Memory For Preset Programming Tasks

Burroughs and Hewlett-Packard have each announced standard office calcula tors incorporating Read-Only-Memory (ROM) modules to provide users with a

stored program capability.

Burroughs is offering two models, designated the C 6200 Series, which allow the user to access up to nine application programs in memory, activated by depressing program selection keys, a spokesman said.

#### **General Business Applications**

Programs are designed for general business applications; including calculation of selling price from cost and desired profit margin; automatic scheduling of com-pound calculations; preparation of depreciation schedules; automatic extensions with proof totals; proration of amounts; distribution of percentages; area volume calculations; job and/or processing costing; and determination of amount and percentage of interest or decrease for comparable periods, the spokesman said.

The C 6201 has seven application pro-

grams, said to be common to most businesses, while the C 6202 includes all seven of the C 6201's programs plus logarithm and standard deviation pro-

Both models have five storage memories used principally for storing of proof totals and/or accumulations, or both, resulting from executed programs, the spokesman stated.

To illustrate time savings using the new calculators, the spokesman said, "only two keyboard operations are required to calculate a selling price from a known cost and a desired gross profit margin. This calculation would require seven steps on a standard duplex calculator.

The C 6201, with seven application programs, costs \$775 and a lease price of \$24/mo. The C 6202, with nine programs, costs \$875 and leases for \$27/mo.

#### **HP Upgrades HP-35**

Hewlett-Packard's entry, the HP-80, is designed to solve equations such as log, sin, cos, tan and xy, with a single key-

stroke, the firm's spokesman said.
In operation, data is entered, then a key is depressed for the unknown. The HP-80 executes the appropriate program, calling upon required functions, each of which is vired into the calculator as a subroutine, the spokesman stated.

Four temporary memory registers -X, Y, Z and T – form the operational stack storing intermediate results accessed by the calculator.

Numbers are entered into the stack from the bottom on a first in, last out basis. When a number is keyed in, it goes into the X register and is dis-played – only the X register is displayed.

When "Save" is pressed, the number is repeated in the Y register. At the same time, any number in Y moves to Z, any number in Z moves to T and the old T value is lost.

Logic for the functional processing is in the form of seven ROMs, the spokesman

Like the previously released HP-35 cal-culator, the HP-80 uses reverse Polish (Lukaiewics) notation, the spokesman

Answers appear on a 15-character light-emitting diode (LED) display with one digit used for the decimal point. Cost of the HP-80 is \$395.

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# 'Hard Line' With Suppliers Paying Off As S&H Shapes Training to Staff Goals

By Don Leavitt

NEW YORK — A DP training program can succeed if it shows a genuine interest in the programmers and analysts to be trained, a business-like concern for the managers involved and an overriding demand for value received from outside vendors.

That is the approach followed by Gail Buerger in her two years as DP training director for Sperry & Hutchinson, and it appears to be working well. Her first major project was to gain profile definitions for existing jobs, not just from formalized job descriptions, but from the people doing the work.

#### **Training Time Precious**

Once training is planned, it is tentatively but formally scheduled, even if it is a self-study program. The programming manager concerned is asked to approve the schedule for his subordinate, but if that is impractical, to assign a substitute so the training time will not be lost.

S&H utilizes a broad assortment of tools, techniques and courses, developed both in-house and

outside the company, to cover desired subjects. But at least one outside vendor had his course canceled two days before it was to be given, because he had not completed the customization of a standard course that S&H had contracted for.

The initial profile definition project worked, Buerger explained recently, because she inter-

# Education

viewed each programmer and analyst as well as having them complete a questionnaire. The interview brought out the workers' own goals, especially once they realized that anything they told Buerger was treated as privileged information.

There is no point in putting people in courses they don't want, she said, recalling a "canned" systems and project control course brought in from the outside. That fell flat because the presenters could not relate the concepts to the S&H

situation, she said.

The company has inadequate training facilities and if there are only a few students scheduled to take a course that is offered elsewhere by an outside vendor, S&H will send its workers out. They have, for example, attended classes at IBM, Advanced Management Research and Software Sciences, she said.

Courses that are essentially brush-up exercises are usually conducted in-house, but here again S&H may use instructors from outside or its own staff. A customized course on ANS Cobol optimization is given "about once a year" by Software Sciences.

#### Does It Herself

A session on RPG is given "when it seems worthwhile" by an IBM teacher, but the 10-week course for trainees is given by Buerger herself.

There are some 75 programmers and analysts, and 160 people overall in the S&H DP department. They have a 370/155 operating in OS/MFT, which is to be converted to MVT, though no timetable has been set for the changeover.

Deltak's multimedia course on OS for applications programming is heavily used at S&H, but not always as Deltak had intended. The readings are generally presented in lecture form, for example, and material on Hasp has been added.

# College Consultants Sponsored by ACM

NEW YORK — Through its College Consultant Service, the Association for Computing Machinery (ACM) is prepared to underwrite the normal professional fees and \$100 of travel expenses to subsidize visits of computer experts to interested colleges in support of undergraduate education.

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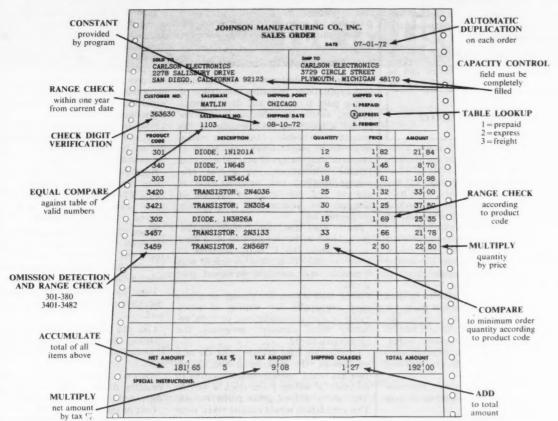
The colleges need not have computer science courses or programs as such, but they must be accredited institutions offering at least a Bachelor's Degree, according to service director Prof. Gerald Engel of Penn State University.

As its commitment to the service, the host school would be expected to pay the consultant's room and board, and any travel expenses above \$100. The service has an extensive list of potential consultants in all parts of the country, to keep the travel costs reasonable.

The service is currently accepting applications for the rest of the 1972-73 academic year, he said, and all visits for that period must be completed by July 31, 1973.

Further information about the service and applications for consultants should be addressed to Engel at the Computer Science Department, 316 McAllister Bldg., Pennsylvania State University, University Park, Pa., 16802.

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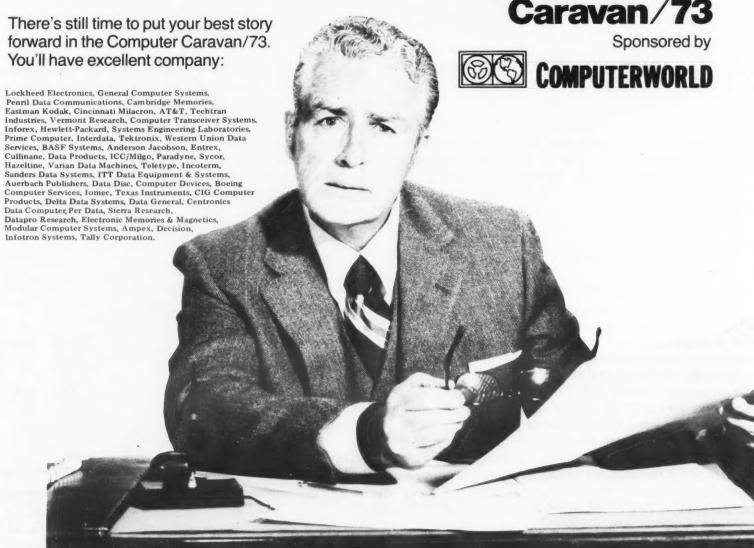
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The Computer Caravan / 73



# CI Notes

# Pact Upsets Some SBCers

NEW YORK - keports are circulating that employees of the Service Bureau Corp., which was sold by IBM to Control Data as part of their suit settlement, are

unhappy with the move.

Several employees are bitter because they were not notified in advance of the planned changes and were not given the option to stay on at IBM in some other capacity.

All this has some other members of the services industry jumping with glee at the prospect of picking up some well-qualified people who now may want to leave SBC for greener pastures.

#### **Iomec Plans Products**

SANTA CLARA, Calif. – Iomec is planning to announce 13 new products this spring in order to broaden its line of peripherals for the minicomputer indus-

try.

The firm is expected to unveil the products on the Computer Caravan's 10-week tour this spring.

#### Supershorts

Storage Technology Corp. has agreed in principle to acquire Promodata S.A., a French peripherals marketer whose line consists principally of STC equipment.

Control Data Corp. has extended its \$1-million agreement with Fabri-Tek Inc. for extension memories for IBM 360s to \$6 million over a two-year period.

Trendata Corp. has signed an equipment purchase/lease agreement with Phoenix Leasing Inc. that provides up to \$24 million for the operating and full payout leasing of Trendata's terminals and automated typing products.

3M Co. has been named U.S. distributor of OCR equipment developed by OCR Systems, Inc.

Wangco Inc. has selected Marubeni Electronics Co., Ltd. as its Japanese distributor of tape and disk drives.

Data Dimensions, Inc. will market Datatype Corp.'s Optical Reading System in the New York and Philadelphia areas.

The IEEE Wincon show, slated for Feb. 13-15 in the International Hotel in Los Angeles, will be based on the theme, "Emerging Business Opportunities Through New Technologies," according to general chairman M.D. Margolis.

NCR, through its rental equipment service centers, has announced a new service under which NCR will rework printed circuit boards and MOS-LSI subassemblies for other companies.

# Illegal Access Charged

# Sues Telex on Trade Secret Issue

By E. Drake Lundell Jr.

Of the CW Staff

TULSA, Okla. – IBM is seeking more than \$25 million in damages from Telex charging that the firm uses industrial es-pionage and other alleged illegal tactics to gain access to IBM trade secrets.

The broad attack on Telex, and, by inference, on others in the peripherals industry came in a counterclaim filed last week in response to the Telex charges that IBM monopolized the computer mar-ket and attempted to stifle competition.

In the brief filed with the court here, IBM denied all the charges made by Telex claiming that such things as integrated peripherals controllers, extended and fixed-term lease plans, etc. were moves made either to meet increased competition or because of advances in technology.

#### Power of Persuasion

In its countercharges against Telex, firm said Telex makes peripherals "primarily by copying, directly or functionally, products designed, developed and manufactured by IBM and others and that to produce such copies Telex obtains IBM trade secrets and confidential information through various forms of industrial espionage, including hiring IBM employees and eliciting trade secrets from them, obtaining copies of IBM confiden-tial documents from present and former IBM employees and obtaining other confidential information from various contacts within IBM."

The ability of Telex and "others" to cut prices below those of IBM, the complaint "has been and is primarily the result of the fact that Telex and others copy" the products offered by IBM.

That practice gives to Telex and others competitive substantial a substantial competitive advantage which... is unfair and unlawful," the complaint charged.

In order to get such trade secret information, the complaint allegeu, "Telex and its officers have offered IBM employees cash bonuses based upon the completion of the copying of IBM products

As an example of this type of action, IBM charged that Telex hired "an important IBM development engineer" who had worked on magnetic disk technology

which had been code-named "Merlin."

IBM said it had invested over \$30 million in the Merlin project.

#### He Made Me an Offer

The Telex agreement with the engineer provided for a bonus of \$500,000 and stock options valued at \$50,000 if he left IBM and developed a system employing the Merlin technology for Telex. In addition, the IBM engineer was authorized, IBM said, to offer other members of the development team bonuses of up to \$100,000 if they would also leave IBM

and join Telex on the project.

At the same time, the counterclaim said, the top 14 officers in Telex were only paid bonuses amounting to \$129,000, "approximately one-fourth the bonus contract with this one individual employee hired from IBM to produce...copies of the Merlin technology." nology

In addition, IBM charged that top Telex officers "have gone so far in implementing their routine misappropriation of officers IBM trade secrets as to advance their own personal funds to induce IBM employees to leave their jobs" and make trade secrets available to Telex. IBM also charged that Telex had vio-

ated the copyright laws by having printed, published and/or distributed 13 different IBM technical manuals or publications, each of which infringes a valid

For relief, IBM asked the court to award

it "the damages it has in fact sustained, which may be measured by one of two alternative methods:

• "The net income of Telex Computer Products, Inc., for the years 1970, 1971, 1972 and to date, an amount not less than \$25,827,000.

• "The difference between the amount IBM expended to design and develop the products which Telex has misap-propriated and used trade secrets and other confidential information and the amount expended by Telex to develop the same products."

IBM also asked the court to enjoin Telex from further use of trade secrets or other proprietary information and from assigning any employee hired from IBM to projects relating to the same types of products he worked on while at IBM.

Telex said the charges were "without

# **Industry Generally Welcomes IBM Key Entry Competition**

By E. Drake Lundell Jr.

Of the CW Staff Industry reaction to IBM's introduction of the 3740 key entry system in the U.S. was muted last week since most market-ing men in the key entry business had expected the announcement ever since brought out the unit in France [CW,

Most observers agreed the move would be a boon to both the present data entry industry as well as to new competition.

"It's better to have them in the market than not," one observer said, since many users would not accept new techniques until those techniques received IBM's blessing in the form of a product.

IBM's acceptance of the concept of key entry equipment that falls somewhere between the keypunch and direct on-line data entry should also serve to educate users about this type of equipment, others said.

"After IBM does the education job and gets the user interested in the products, we should have an easier time selling to them," one marketing man said, "since we can offer products that are better on a price/performance basis.

"Of course," he admitted, "IBM is going to be a major factor in the market and is going to sell a lot of the units to its captive user base."

#### **New Market Opportunities**

However, he added, the move should open up new market opportunities for the independents among independent users who were just waiting for IBM to endorse the concept before deciding to change from a keypunch operation to a

newer method for data entry. Industry sources were not sure exactly how the 3740 would fit into the total data entry market. They noted the device was aimed at small installations, but said might carry a price tag that is too steep for many smaller users.

They agreed the 3740 would not provide major competition for the large shared-processor or key-to-disk systems offered by such firms as General Com-puter Systems, Computer Machinery Corp., Inforex, Entrex and others, since it would not really be price/performance

competitive in large shops.

At the same time, the possible effect of the new device on the keypunch market

One industry observer dealing in the used equipment market does not feel the release of the 3740 will impact the keypunch market since the demand is so great for IBM 029s and 129s – users even

have to wait for delivery.

He feels the impact will be gradual, from the top down, with the sophisticated users with many remote installations the first to employ the floppy disk approach to data entry.

By pushing the concept of communica-tions with the new unit, IBM is also making it easy for users to upgrade from the 3740 to direct on-line data entry, one source noted, adding that IBM had been pushing the concept of direct data entry as the eventual replacement for the key-

One note of worry in the industry reaction was for the possible effect of the IBM endorsement of the floppy disk as the storage medium for data entry sys-

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# Finding a Computer's Residual Value Can Be Tricky, Government Discovers

By Gerald M. Galler

Special to Computerworld
Since 1961, agencies and departments of the Federal Government have been required to evaluate the economics of lease versus purchase in the acquisition of computer equipment.

Among the factors requiring consideration in such an analysis are cost of money (interest) and residual value of equipment.

#### But How . . . ?

Although these factors are required to be considered, very little guidance is provided re-garding how they are used. Agencies are permitted complete flexibility in establishing useful equipment life, residual value and cost of money.

Agencies not wanting to purchase equipment can establish a low residual value and high cost of money to ensure that the lease versus purchase analysis will always favor leasing.

The establishment of the General Services Administration
ADP Revolving Fund that purchases equipment for re-lease government agencies is a further indication and reaffirmation of the government's intent to purchase equipment if at all economically feasible

Furthermore, the success that GSA has experienced in placing equipment into agencies from the excess equipment pool as well as operating a "profitable" Revolving Fund substantiates the viability of purchasing new (and sometimes used) equipment and recirculating it.

The increasing emphasis on purchase and reutilization of computer equipment resulted in the emergence of what once was a relatively obscure sentence in the Office of Management and Budget Circular A-54 to one of the most controversial issues associated with determining the evaluated cost of DP equipment in a competitive procurement. The subject in question is resi-

dual value, its use and abuse.

There are at least seven basic methods of determining residual

- Straight-line depreciation.
- Second and tertiary users (useful life beyond initial installation period).
- Guaranteed buy-back • Scrap value at end of useful
- Fixed percentage of lowest purchase price among qualified
- Estimated used equipment value at end of government life cycle.
- A dollar value set by the agency or department prior to the procurement.

#### How Established?

The first questions which come to mind are, for example, who establishes the residual value of computer equipment to the government, and on what basis? Currently, each agency estab-lishes the residual value to be whatever it wants it to be.

Let us examine the implica-tions associated with the maworth given to residual value. It must either be zero or greater than zero. If it is zero, it will very likely make rental ap-pear to be less costly than purchase since, among other things, maintenance and interest are added to the purchase price but not the rental price.

If residual value is greater than zero, then it must be either less than, equal to, or greater than the cost of money. If less than the cost of money, the evalua-tion cost for purchase will be increased by the difference and could be more costly than rental. If equal to the cost of money, the evaluation cost is the quoted purchase cost and a comparison is simply made of the quoted rental and purchase plus maintenance prices.

If it is greater than the cost of money, then purchase will generally appear to be less costly than rental. In any case, if the residual value is to be greater than zero, then by what means is that value to be determined?

GSA, for example, depreciates equipment on a straightline basis at the rate of 15% per year, but this doesn't always work.

For example, a component of the Department of Defense prepared a specification and sub-mitted it to its central procurement office for computer equipment for approval and subsequent release for competitive bids. Instead it was advised that an IBM 360/50 was being rement pool from the Department of Agriculture and would be available on a three-year lease at substantial savings over commercially available equipment of equivalent capacity and capa-

That 360/50 bears the serial number 1, manufactured in 1963. It is currently nine years old and will be 10 years old when the lease with GSA runs out. Changes are quite send that out. Chances are quite good that it will be retained beyond the initial lease period for at least several more years. The system is functioning quite well and is performing meaningful work.

There is no reason to believe that it will not have a 15-year life, almost twice the maximum life currently used for evaluation

Has the residual value of this 360/50 increased or was it really worth a substantial percentage of its original purchase price at the end of five years? According to GSA's calculations (15% per year) it would have had a value of zero at the end of seven years.

Until now, no mention has been made of hardware and software enhancements or new product line announcements which, when implemented over the course of a system's life, can significantly increase the residual value, particularly when con-sidered in terms of useful years operation beyond the first five.

The GE-225 was already several years old when a com-mercialized version of the Dartmouth time-sharing software was made available. The system emerged as a GE-265 and is still performing well today.

#### **Breathing New Life**

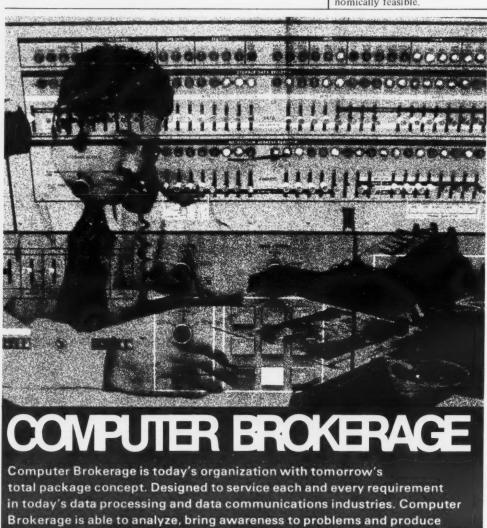
Consider the GE-600 Series, irst announced in early 1964 and destined for a mediocre and limited existence. The emergence of Gecos III in 1968 immediately enhanced the Series 600 residual value.

The announcement of the H-6000 line of compatible systems, like IBM's 370 announcement, further extended the "desirable" life of the 600 product line. The life of the Series 600 was further extended by the recent award of the WWMCCS contract worth over \$50 million for the Honeywell 6000 Series.

So here it is, eight years after the GE-600 was announced, and finding any for sale on the used computer market would be most improbable. The 600 system already in its last year of depreciated system life has at least three to five years of useful, revenue-producing life remain-ing. In 1967 GE could not give away a 600. If you order one now from Honeywell, you probably won't be able to get it this year. So what is its residual value

The government is aware of the problem. It simply chooses not to disclose it publicly until it has a solution. To this end, a special subcommittee was formed under the Ad Hoc ADP Committee of the Computer Performance Evaluation Users' Committee.

Gerald M. Galler is president of Federal Marketing Counsellors



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# Adapso Expands Role in Fight Against 'Incremental Marketing'

NEW YORK - The Association of Data Processing Service Organizations (Adapso) has expanded its fight against what it considers illegal marketing of computer services by organizations whose major business lies outside the data processing area.

For years, the organization has fought the "incremental marketing" of computer services by other firms. An example of this type of marketing practice would be where an auto maker found it had extra computer time and would offer it to its dealers on a service basis.

Since the firm is already underwriting the costs of its computer operation, Adapso apparently feels the firm can offer the service at unrealistic prices, therefore cutting into the market available to Adapso's members.

"All of the resoness we have received."

"All of the responses we have received from our members and others have indicated that this problem is one of the key economic issues in the computer services industry," according to Thomas O'Rourke, president of Adapso.

"Our membership welcomes and en-courages fair competition. However, it will fight tooth and nail competition from organizations who use monopoly positions and power developed in other lines of commerce, to restrain free trade and competition in our industry."

O'Rourke stated the enlarged program would be several-pronged. "First," he said, "Adapso will act as a communications center or clearinghouse, accumulate evidence of unfair or illegal marketing problems, whether furnished us by our

members or third parties.
"Second, Adapso will do whatever it lawfully can to assist members who are actively fighting this problem, whether before administrative agencies, in the Congress, in the courts or otherwise. This

would include, under appropriate circumparticipation by Adapso as plaintiff in litigation.
"Third," he concluded, "to the extent

we are able to do so, we will also financially assist members who are under unlawful attack from incremental mar-

Adapso said that incremental marketing exists whenever a seller marketing a product in a separate line of commerce also markets a not insubstantial volume of computer services, and where the fol-lowing circumstances are present:

• The first product is patented or copyrighted, or otherwise a lawful monopoly of the seller.

● There exists some special relationship between the seller and the purchaser which is independent of the particular purchase-sale relationship giving rise to the questioned transaction, such as by way of dealership, franchise or license.

The seller offers its computer services only to those purchasing the major prod-

uct and not generally.

The major product is important to the business of the computer services organizations in the pertinent market.

• The seller is of large size, relative to the computer services organizations in the pertinent market.

Daconics to Supply Minis For Atmospheric Study

SUNNYVALE, Calif. - Daconics Corp. has received a contract, which could total \$1.7 million, from the National Oceanic and Atmospheric Administration for three minicomputers to be used to study upper-air data.

The contract includes an option to purchase 95 additional minicomputers over a period of three years.

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#### THE AUTHORS

Roger MacGowan is professor of Computer Science with the Dept. of Defense Computer Institute in Washington, D.C. and is a frequent contributor to professional journals.

Reid Henderson is President of Compudemics, Inc., and is both a CPA and CDP. He also lectures at George Washington University and the Industrial College of the Armed Forces.

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# Cyber 70 to Link Polish Universities

SWIERK, Poland - A Control Data Corp. Cyber 70 Model 72 will form the basis of a network system that will service several educational and scientific institutions in Poland.

The CDC Model 72 will be located at the Nuclear Research Institute here, with terminals at the Polish Academy of Sciences, the Warsaw University and the Technical University of Warsaw, as well as the Warsaw University of Planning and Statistics

# Foreign Orders & Installations

The system will include a full line of peripheral equipment.

The main applications will be a mixture of pure scientific work, with the nuclear sciences having the major share of time on the computer.

#### Other Orders, Installations

The Imperial Iranian Air Force has installed a Honeywell 6060, valued at \$3.1 million, to control its spare-parts inventory for all

Ciber Clinica, Sao Paulo, Brazil, has purchased a computerized medical system from International Health Systems, Inc. to automate physical-exam

Shawinigan Engineering Co., a Montreal consulting firm, has ordered a Meta 4/1130 Emulator Computer System from Digital Scientific Corp.

Scientific Control Systems Ltd., a British computer service bureau, has ordered its third Univac 1108 system for use in real-time and batch applications.

# Acquisitions

Neoterics, Ohio-based computer service organization, has acquired RPA Ohio-based Computer Services, Inc. of Columbus, Ohio.

Granite Management Services, Inc. has acquired Capital Ventures Inc., the mortgage banking subsidiary of Empire National Bank of Newburgh, N.Y., for an unspecified amount of cash and

Analog Devices has agreed to purchase certain assets of Megadyne Industries, Inc., manufacturer of precision thin-film resistor networks and thin-film substrates, for an undisclosed substrates, for amount of cash.

Itel Corp. has agreed to acquire Pyramid Industries, a Los Pyramid Angeles-based computer service company. Pyramid will be merged into the DP division of Itel under terms of the trans-

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Intranet Computing Corp., memory manufacturer, has acquired Bio-Optronics, Inc., a Los Angeles-based manufacturer of medical instruments.

Omron R & D, Inc., a U.S. subsidiary of Omron Tateisi Electronics Co., Japan, has acquired a majority of the com-mon stock of Data Memory, Inc. Data Memory manufactures video-disk recorders for television and instrumentation industries.

Citizens Financial Corp. has agreed in principle to acquire Northeast Data Com, Inc., a sub-sidiary of The New Haven Savings Bank. Northeast Data Com will be combined with Citizens Financial's data service unit.

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#### Different Trends

# Two Software Houses Show Losses

Although two software firms have shown losses for recent periods, the trends were different, with one improving its ledger, and the other going from profit to loss.

Applied Logic Corp. cut its losses for the year ended Sept. 30 to \$271,061 or 15 cents a share from last year's \$2.7 million loss. Cybermatics Inc., however, ran into problems on two large fixed price contracts, and showed losses in both the second quarter and six months.

At Applied Logic, fourth quarter earnings of \$75,249 on revenues of \$858,958 helped reduce losses for the year. The implementation of quasi-reorganization at the start of fiscal 1972, and continuing improvements in the cost to revenue ratio con-tributed to the decreased losses.

#### Cybermatics Stable

Second quarter revenues were stable at Cybermatics, remaining around \$1.8 million in both the 1971 and 1972 periods.

The loss for the quarter totaled \$86,656 or 9 cents a share compared with earnings of \$98,670 or 9 cents a share in the year-ago period.

In the six months, revenues totaled \$3.7 million compared with \$3.2 million in the year-ago period. The loss totaled \$43,568 or 4 cents a share compared with earnings of \$160,917 or 15 cents

"The earnings decline reflected problems on two large fixed price contracts within the Software Division; each of the other divisions - Carci Computab Systems, Inc., Trademark Service Corp. and Automated Labels & Forms, Inc. – continued to show substantial revenues and contribute profits," explained President J. Roy Morris.

#### Losses Included

Losses, both incurred and projected, on these projects have been included in the second

## Trilog Explains Loss

PHILADELPHIA – Trilog Associates reported a first quarter loss of \$8,661 on reve-nues of \$437,293. In the com-parable year-ago period, the firm earned \$15,519 on \$451,298. New product development pro-

grams have been curtailed in the period, and amortization begun on several products in develop-ment last year, noted President Donald J. Devine. In the three months ended Oct. 28, software amortization exceeded capitalization by about \$11,800.

Custom systems engineering project business continues to decline, and the firm is "directing its attention to the further development of custom facilities manservices, package software and package processing ser-

'We now expect to complete the second contract by the end of 1972 and at that point will be free of all unfavorable contracts. The division should be able to reestablish the pattern of growth it experienced in prior years," he

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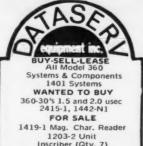
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In our February 28th Software Supplement, Computerworld will be taking a hard look at a variety of software sources currently available to EDP users. Payroll packages, Inventory. Accounts Receivable. And others.

Our Feb. 28th supplement will also examine some of the companies that produce and sell software packages, custom programming services, programming aids and remote-computing application services.

If you are selling in the Software market place your ad should be there on Feb. 28th. Supplement closing is February 9. Your *Computerworld* representative can give you all the details. Or call Judy Milford at (617) 332-5606.



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# Nickels & Dimes

IBM's board of directors has recommended a five-for-four stock split and boosted the quarterly dividend on presplit common stock by 5 cents to \$1.40, payable March 10 to stock-holders of record Feb. 14.

Computer leasing at two diversified firms, DPA and Dearborn-Storm "continues to provide sub-stantial cash flow." DPA's leas-ing unit had record sales in the year ended Nov. 30, and helped repay debts of over \$7 million. Although Dearborn-Storm's division had decreased earnings and revenues in the year ended Oct. 31, all mainframes continue under lease.

888

GRI Computer's sales for the six months ended Oct. 31 grew from \$425,000 to \$637,000, but at the same time losses increased from \$71,000 to \$367,000. Start-up and development costs for a microcircuits facility in Florida contributed \$90,000 to the period's losses, and the GRIseries was phased out while the GRI-99 series began.

The "strong upswing" at Electronic Associates for 1972 stemmed from increased demand for the firm's computer products the firm's computer products, especially the Pacer systems introduced last spring. EAI expects to report operational per-share net of about 34 cents for 1972, up 240% from 14 cents last year. The firm begins 1973 with a \$16 million backlog, whereas last year the order load stood at \$14 million.

Computer Control Systems has its name to Telechanged switcher.

Several firms have begun the new year with increased lines of credit from their bankers. Four-Phase Systems has extended its line of credit to \$10 million through the Bank of America. Available on a revolving credit basis through Sept. 30, 1973, the funds will be used to finance leasing and the accounts received. leasing and the accounts receiv-

\$\$\$

Digital Information Devices has increased its borrowing ceiling with the First National Bank of Boston from \$600,000 to \$1 million, and converted such borterm debt payable Sept. 30, 1974. rowing from short-term to long-

Lundy Electronics & Systems has secured a \$5 million twoyear agreement with the First National City Bank of New York and the Security Bank of Long

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# Sperry Rand Sets Records In Quarter, Nine Months

NEW YORK - Strong demand for computers, as well as other capital goods, has helped Sperry Rand boost third quarter earnings 43% on a 25% increase in revenues.

In the nine months ended Dec. 31, Sperry Rand scored about a 50% rise in earnings on a 25% jump in revenues.

Both periods set records for the firm and gains are expected to continue through the fiscal year, according to Chairman J. Paul Lyet. "Revenues, net income and bookings for Sperry Univac computers in the nine months were well ahead of the comparable period last year,' observed Lyet.

In the third quarter, earnings totaled \$23.4 million or 68 cents a share, compared with a restated \$16.4 million or 48 cents a share in the year-ago period. Revenues climbed to \$565.4 million from \$453.9 million in the same quarter last year.

In the nine months, earnings jumped to \$60.8 million or \$1.77 a share on revenues of \$1.6 billion. In the same period last year, earnings totaled \$40.7 million or \$1.19 a share on revenues of \$1.3 billion.

The earnings per share for the nine months equaled that for the entire previous fiscal year ended March 31.

"We are benefitting directly from improved internal opera-tions coupled with a stronger demand for capital goods as industry increases its investment in a new plant and equipment,'

# Despite Revenue Rise

# Xerox DP Still in Red

Although worldwide revenue from the computer segment of Xerox Corp. rose 19% to about \$86 million, the unit continued to show a loss, while total Xerox earnings rose 17% for the year to \$249.5 million.

Revenues in the computer unit exclusive of results from Diablo Systems, Inc., acquired during the year.

Heavy investments in product development and expansion of marketing forces contributed to the unit's loss for the year, ac-cording to Chairman C. Peter McColough.

However, he explained, "we see significant progress coming in 1973, and we are very hopeful that within three years at the outside, we will get to break even in what you would consider our traditional computer busi-

McColough expects computer operations in '73 to show a smaller operating loss and "significantly" lower inventory write-

The computer segment showed about the same deficit and writeoffs in 1972 as it did in 1971, he said, or about \$24 million in pre-tax operating loss and \$14 million in pre-tax writeoffs, for a \$38 million deficit.

Xerox plans to introduce over a dozen new products during the year, which are expected to be in the computer, facsimile and copier-duplicator areas

#### Data General Doubles First Quarter Net

SOUTHBORO, Mass. - Data General Corp. more than dou-bled its first quarter earnings in the period ended Dec. 23.

Earnings jumped to \$1.3 million or 46 cents a share from a restated \$595,000 or 22 cents a

share in the year-ago period. Revenues rose to \$9.8 million from \$5.3 million in the first

The results for the previous year's quarter were restated to reflect a pooling of interests.

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# Computerworld **Stock Trading Summary**

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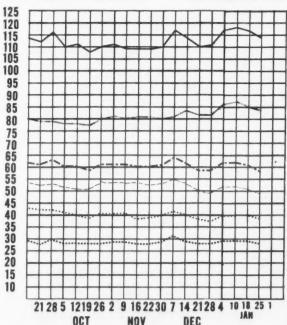
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OCMPUTER USAGE 7-14 8 1/8 - 3/8 -4.4   COMPUTING & SOFTWARE 11-28 10 3/4 -2 1/4 -17.3   OCMSHARE 1-3 1 0 0 -0.0   OCMSHARE 5-10 9 + 5/8 + 1/4 + 10.8   OEDP RESOURCES 2-8 2 3/4 + 1/4 + 10.8   OEDP RESOURCES 2-8 2 3/4 + 1/4 + 10.8   OEDP RESOURCES 2-8 2 3/4 + 1/4 + 10.8   OEDP RESOURCES 2-8 2 3/4 - 1/4 - 3/8   OEDP RESOURCES 2-8 2 3/4 - 1/4 - 1/6   OEDP RESOURCES 2-8 2 3/4 - 1/4 - 5/8 - 11.6   OEDP RESOURCES 2-8 2 3/4 - 1/4 - 5/8 - 11.6   OEDP RESOURCES 3-8 2 3/4 - 3/8 - 9.0   OEDP RESOURCES 3-9 3 3/4 - 3/8 - 9.0   OEDP RESOURCES 3-9 3 3/4 - 3/8 - 9.0   OEDP RESOURCES 3-9 3 3/4 - 3/8 - 9.0   OEDP RESOURCES 3-9 3 3/4 - 3/8 - 9.0   OEDP RESOURCES 3-9 3 3/8 - 1/2 - 11.6   OEDP RESOURCES 3-9 3 3/8 - 1/2 - 1/4 - 9.0   OEDP RESOURCES 3-9 3 3/8 - 1/4 - 1/4 - 9.0   OEDP RESOURCES 3-9 3 3/8 - 1/4 - 1/4 - 9.0   OEDP RESOURCES 3-9 3 3/8 - 1/4 - 1/4 - 9.0   OEDP RESOURCES 3-9 3 3/8 - 1/4 - 1/4 - 9.0   OEDP RESOURCES 3-9 3 3/8 - 1/4 - 1/4 - 9.0   OEDP RESOURCES 3-9 3 3/8 - 1/4 - 1/4 - 9.0   OEDP RESOURCES 3-9 3 3/8 - 1/4 - 1/4 - 9.0   OEDP RESOURCES 3-9 3 3/8 - 1/4 - 1/4 - 9.0   OEDP RESOURCES 3-9 3 3/8 - 1/4 - 1/4 - 9.0   OEDP RESOURCES 3-9 3 3/8 - 1/4 -			COMPUTER TASK GROUP	1- 2	1 3/8	+ 1/8	+10.0
O COMSHARE  O DATA TAB O DATA O DATA TAB O DATA TAB O DATA O	ı	_	COMPUTER USAGE	7- 14	8 1/8		
O DIAIAMS O EDIRESGONCES O EDIRESGONES O ENCOMP NELECTRONIC DATA SYS. 43-65 52 2/4 - 3/8 -0.7 O INFORMATICS O I.O.A. DATA CORP I - 3 3/4 - 0 0.0 O KENDATA CORP I - 3 3/4 - 0 0.0 O KENDATA CORP I - 3 3/4 - 0 0.0 O KENDATA CORP I - 3 3/4 - 0 0.0 O KENDATA CORP I - 3 3/4 - 0 0.0 O KEYDATA CORP I - 3 3/4 - 1/6 - 8.5 O LOGICON O MATIONAL CORP I - 3 3/4 - 2/7 - 8.5 O LOGICON O MATIONAL CORP I - 3 3/4 - 1/6 - 8.5 O MATIONAL CORP O N LINE SYSTEMS O PROGRAMMING FEHOLOS O PROGRAMMING ESTACH O PROGRAMMING SYS I - 2 3/4 - 1/4 - 1/0 O PROGRAMMING SYS I - 2 3/4 - 1/4 - 1/0 O SIMPLICITY COMPUTER O SIMPLICITY COMPUTER O TYPISHARE INC I - 3 1/2 - 1/8 - 2/0 O TO TYMSHARE INC I - 3 1/2 - 1/8 - 2/0 O TYMSHARE INC							
A ELECT COMP PROG	ı	0	DATATAB	4- 9	4	+ 1/8	+3.2
O INFORMATICES	I	A	ELECT COMP PROG	1 - 5	1 5/8	0	0.0
O KEANE ASSOCIATES		0	INFORMATICS	5- 11	4 3/4	- 5/8	-11.6
O LIGGICON		0	KEANE ASSOCIATES	4- 7	3 3/4	0	0.0
O NATIONAL INFO SYCS 1-0 5 21 1/4 + 1/8 + 5.8 P ON LINE SYSTEMS INC 8-28 24 1/2 - 11 1/2 - 5.7 P ON LINE SYSTEMS INC 8-28 24 1/2 - 11 1/2 - 5.7 N PLANNING RESEARCH 5-17 4 7/8 - 1/4 - 4.8 P ON LINE SYSTEMS INC 8-28 24 1/2 - 11 1/2 - 5.7 N PLANNING RESEARCH 5-17 4 7/8 - 1/4 - 4.8 P ON LINE SYSTEMS INC 8-28 24 1/2 - 1/4 - 1.0 O PROGRAMMING METHODS 20-25 23 3/4 - 1/4 - 2.8 O PROGRAMMING METHODS 20-25 23 3/4 - 1/4 - 2.8 O PROGRAMMING METHODS 20-25 23 3/4 - 1/4 - 2.8 O SCIENTIFIC COMPUTERS 3- 6 3 1/2 - 3/8 + 12.0 O SIMPLICITY COMPUTER 1- 5 3 1/2 - 3/8 + 12.0 O SIMPLICITY COMPUTER 3- 6 3 3/4 - 1/8 - 3.2 O TCC INC 1- 3 1/2 - 1/8 - 2.0 O TSS COMPUTER CENTERS 3- 6 3 3/4 - 1/8 - 3.2 O TCC INC 1- 3 1/2 - 1/8 - 2.0 O TWISHARE INC 7- 12 10 7/8 + 1/4 + 2.3 O UNITED DATA CENTER 5- 8 6 0 0.0 N UNIVERSITY COMPUTING 8- 26 8 1/2 - 1/4 - 2.8 O AURS SYSTEMS PERIPHERALS & SUBSYSTEMS NADDRESSOGRAPH-HULT 27-49 27 - 3 3/8 - 11.1 O ADVANCED MEMORY SYS 12-23 21 1/4 - 13/8 - 6.0 O BEEHIVE MEDICAL ELEC 1- 8 6 7/8 - 3/8 - 6.5 O BEEHIVE MEDICAL ELEC 1- 8 6 7/8 - 3/8 - 6.5 O BEEHIVE MEDICAL ELEC 1- 8 6 7/8 - 3/8 - 5.1 A BUNKER-RAMD 9- 14 9 1/8 - 1/4 - 2.2 O COMPUTER COMMUN. 9- 12 10 5/8 - 1/4 - 2.6 O COMPUTER COMMUN. 1- 7 3 3/8 + 1/8 - 4.7 O COMPUTER COMPUN. 1- 7 3 3/8 + 1/8 - 4.7 O COMPUTER MACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER TRANSCEIVER 2- 9 4 1/2 - 3/8 - 7.6 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/8 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/9 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/9 - 3.4 O COMPUTER RACHINERY 7- 13 10 5/8 - 1/9 -	ı	0	LOGICON	4- 9	3 3/4	- 3/8	-9.0
P ON LINE SYSTEMS INC	ı	0	NATIONAL CSS INC	8- 36	33 5/8	-2 1/8	-5.9
O PROGRAMMING METHODS   20-25   23 3/4   -1/4 -1.0   O PROGRAMMING SYS   1-2 3/4 -3/4 -3.1   O RAPIDATA INC   5-27   23 1/4   -3/4 -3.1   O SCIENTIFIC COMPUTER   1-5 3 1/2   +3/8 +12.0   O SIMPLICITY COMPUTER   1-5 3 1/2   +3/8 +12.0   O TOS COMPUTER CENTERS   3-6 3 3/4   -1/8   -3.2   O TCC INC   1-3   1/2   -1/8   -20.0   O TYMSHARE INC   7-1   10 7/8   +1/4 +2.3   O UNITED DATA CENTER   8-6   8 1/2   -1/4   -2.6   N UNIVERSITY COMPUTING   8-26   8 1/2   -1/4   -2.6   N UNIVERSITY COMPUTING   8-26   8 1/2   -1/4   -2.6   N UNIVERSITY COMPUTING   8-26   8 1/2   -1/4   -2.6   N ADDRESSOGRAPHMULT   7-49   27   -3 3/8   -11.1   O ADVANCED MEMORY SYS   12-23   21 1/4   -1 3/8   -6.0   N AMDERSON JACOBSON   4-8   4 3/4   -1/8   -2.5   O BEEHLY MEDICAL ELEC   1-8   6 7/8   3/8   -5.1   O BEEHLY MEDICAL ELEC   1-8   6 7/8   3/8   -5.1   O BEEHLY MEDICAL ELEC   1-8   6 7/8   3/8   -5.1   O COMPUTER COMMUN:   4-7   13/8   -4.4   O COMPUTER COMMUN:   4-7   13/8   -4.7   O COMPUTER COMMUN:   4-7   13/8   -4.7   O COMPUTER TRANSCETVER   2-9   4 1/2   -3/8   -7.6   O DATA RECOGNITION   2-5   3 7/8   +1/4   -1.0   O DATA TECHNOLOGY   2-5   3 7/8   -1/8   -3.1   N HAGELITINE COMP   3-7   4   0   0   0   O OPTICAL SCANNING   5-16   5 1/4   0   0   0   O PERTEC COMP   7-7   7   7   7   7   7   7   7   7	I		ON LINE SYSTEMS INC				
O PROGRAMMING & SYS	1	0	PROGRAMMING METHODS	20- 25	23 3/4	- 1/4	-1.0
O SIMPLICITY COMPUTER 1-5 3 1/2 + 3/8 + 12.0  O TOS COMPUTER CENTERS 3-6 3 3/4 - 1/8 -3.2  O TCC INC 1-3 1/2 - 1/8 -20.0  O TYMSHARE INC 7-12 10 7/8 + 1/4 + 2.3  O UNITED DATA CENTER 5-8 6 0 0.0  N UNIVERSITY COMPUTING 8-26 8 1/2 - 1/4 - 2.8  A URS SYSTEMS PERIPHERALS & SUBSYSTEMS  PERIPHERALS & SUBSYSTEMS  N ADDRESSOGRAPHHUIT 27-49 27 - 3 3/8 -11.1  O ADVANCED MEMORY SYS 12-23 21 1/4 - 1 3/8 -6.0  N AMPES CORP 15-15 5 3/4 - 1/4 - 2.5  A BOLT, BERANKE 6 NEW 5-15 5 3/4 - 1/8 -2.5  A BOLT, BERANKE 6 NEW 5-21 10 5/8 - 1/4 - 2.6  A BEEHTVE MEDICAL ELEC 1-8 6 7/8 - 3/8 - 5.1  A BOLT, BERANKE 6 NEW 9-14 9 1/8 - 1/4 - 2.2  A BURKER-RAMO 9-14 9 1/8 - 1/4 - 2.2  A CALCOMP 9-14 9 1/8 - 1/4 - 2.0  C COMPUTER TAINCHINERY 0-15 12 3/4 - 1/4 - 1.9  C COMPUTER COMMUN. 1-7 3 3/8 1/4 1/4 + 1.0  C CODEX CORP 6-28 23 1/4 1/4 + 1.0  C COMPUTER MACHINERY 7-13 10 5/8 - 1/8 - 3.0  A COMPUTER TAINCETORP 3- 9 3/4 - 1/4 - 6.2  C COMPUTER TAINCETORP 3- 9 3/4 - 1/4 - 6.2  O COMPUTER TAINCETORP 3- 9 3/4 - 1/4 - 6.0  C COMPUTER TAINCETORP 3- 9 3/8 - 1/4 - 1/4 - 6.0  O DATA RECOGNITION 1-5 2 1/2 - 1/8 - 3.0  O DATA RECOGNITION 1-5 2 1/2 - 1/8 - 3.0  O DATA RECOGNITION 1-5 2 1/2 - 1/4 + 6.5  O DATA RECORDITOR S- 9 3/4 - 1/4 - 6.5  O DATA RECORDITOR S- 9 3/4 - 1/4 - 6.5  O DI/AN CONTROLS 0-8 3 7/8 - 1/4 - 2.6  O DATA RECORDITOR 1-5 3 7/8 - 1/4 - 6.5  O DATA RECORDITOR 1-5 3 7/8 - 1/4 - 6.5  O DATA RECORDITOR 1-5 3 7/8 - 1/4 - 6.5  O DATA RECORDITOR 1-5 3 7/8 - 1/4 - 6.5  O DATA RECORDITOR 1-5 3 7/8 - 1/4 - 6.5  O DATA RECORDITOR 1-5 3 7/8 - 1/4 - 6.5  O DATA RECORDITOR 1-5 3 7/8 - 1/4 - 6.5  O MARGER INCERTOR 1-7 1-7 1-7 8 3/8 - 1/8 - 3.1  N ELECTRONIC M 3-8 3/4 - 1/4 - 6.5  O MARGER TECHNOLOGY 1-7 1-7 1-7 8 - 3.0  O MARGER TECHNOLOGY 1-7 1-7 1-7 8 - 3.0  O MARGER TECHNOLOGY 1-7 1-7 1-7 1-7 8 - 3.0  O PERCE CORP 1-7 1-7 1-7 1-7 1-7 1-7 1-7 1-7 1-7 1-7	ı	0	RAPIDATA INC	5- 27	23 1/4	- 3/4	-3.1
O TCC INC O TYMSHARE INC O NO N UNIVERSITY COMPUTING 8- 26 8 1/2 - 1/4 -2-8 6 00 0.0 O 0.0 O UNIVERSITY COMPUTING 8- 26 8 1/2 - 1/4 -2-8 A URS SYSTEMS  N ADDRESSOGRAPH-MULT O Z- 49 27 -3 3/8 -11.1 O ADDRESSOGRAPH-MULT O CAMBRIDGE MEMORIES O - 16 9 1/8 - 1/4 - 4-1 O CALCOMP O CAMBRIDGE MEMORIES O - 17 9 1/8 - 1/4 - 2-2 O CAMBRIDGE MEMORIES O - 15 10 3/4 - 1/4 - 2-2 O COMPUTER COMP O - 25 10 3/4 - 1/4 - 1-9 O CONDUTER COMPO O CODEX CORP O COMPUTER COMMUN. O COMPUTER TANNSCEIVER O COMPUTER TRANSCEIVER O COMPUTER TRANSCEIVER O COMPUTER TRANSCEIVER O D DATA RECOGNITION O DATA TECHNOLOGY O DATA RECOGNITION O DATA TECHNOLOGY O DATA RECOGNITION O DATA TECHNOLOGY O COPE O COMPUTER SYS O NAME CORP O COM	I	0	SIMPLICITY COMPUTER	1- 5	3 1/2	+ 3/8	+12.0
O TYMSHARE INC	l						
A URS SYSTEMS  PERIPHERALS & SUBSYSTEMS  N ADDRESSOGRAPH-MULT  27- 49 27 -3 3/8 -11.1  0 ADVANCED MEMORY SYS 12-23 21 1/4 -1 3/8 -6.0  N AMPEX CORP  0 ANDERSON JACOBSON 5- 15 5 3/4 -1/4 -2.5  0 BEEHIVE MEDICAL ELEC 1- 8 6 7/8 -3/8 -5.1  A BOLT-BERANEK & NEW 5- 21 10 5/8 -1 1/4 -2.2  N BUNKER-RAMO 5- 21 10 5/8 -1 1/4 -2.2  A CALCOMP  0 CAMBRIDGE MEMORIES 9- 15 12 3/4 - 1/4 -1.9  0 CCONTRONICS DATA CONP 6- 28 23 1/4 + 1/4 -1.9  0 COORTIRONICS DATA CONP 6- 28 23 1/4 + 1/4 -1.9  0 COORTIRONICS DATA COMP 6- 28 23 1/4 + 1/4 -1.9  0 COORTIRONICS DATA COMP 6- 28 23 1/4 - 1/4 -1.9  0 COMPUTER COMMUN. 1- 7 3 3/8 + 1/8 +3.8  COMPUTER COMMUN. 1- 7 3 3/8 + 1/8 +3.8  COMPUTER TRANSCEIVER 2- 9 4 1/2 -3/8 -7.6  N COMPUTER TRANSCEIVER 3- 9 15 12 3/4 - 1/4 -6.2  N COMPUTER TRANSCEIVER 2- 9 4 1/2 - 3/8 -7.6  N CONRAC CORP 24-39 27 1/2 - 7/8 -3.0  DATA RECOGNITION 1- 5 2 1/2 + 1 1/4 +100.0  DATA RECOGNITION 1- 5 2 1/2 + 1 1/4 +100.0  DATA RECOGNITION 1- 5 2 1/2 + 1 1/4 +100.0  DATA RECOGNITION 1- 5 2 1/2 + 1 1/4 +100.0  DATA RECOGNITION 1- 5 2 1/2 + 1 1/4 +100.0  DATA RECORNITION 1- 5 2 1/2 - 7/8 -3.1  N ELECTRONIC M & M 3- 8 4 5/8 - 1/8 -2.6  FABRI-TEK 0- 8 3 7/8 - 1/8 -3.1  N ELECTRONIC M & M 3- 8 4 5/8 - 1/8 -2.6  GENERAL COMPUTER SYS 6- 16 7 3/4 + 3/4 +10.7  O GENERAL ELECTRIC 9- 7- 13 8 1/8 + 1/2 +6.5  O INFORMATION DISPLAYS 1- 5 1 - 1/8 -11.1  O INFORMATION DISPLAYS 1- 5 1 - 1/8 -11.1  O INFORMATION NITL INC 8- 25 12 1/2 - 1  A MILGO ELECTRONICS 1- 8- 14 8 3/4 + 1/4 -2.9  O MANAGEMENT ASSIST 1- 1 1/4 - 1/8 -33.3  A 1/44.2  O MANAGEMENT ASSIST 1- 1 1/4 - 1/8 -33.3  A 1/44.2  O MANAGEMENT ASSIST 1- 1 1/4 - 1/8 -33.3  A 1/44.2  O MOHAWK DATA SCI 9- 27 9 7/8 - 3/4 -7.0  O OPEC COMPUTER SYS 6- 16 5 1/4 0 0.0  O PERTEC CORP 7- 17 7 - 1/4 -3.4  O PHOTON 4- 15 5 5 5 3/8 - 1/4 -6.5  N MOHAWK DATA SCI 9- 27 9 7/8 - 3/4 -7.0  O OPEC COMPUTER SYS 6- 16 5 1/4 - 1/2 - 1.5  O SCAN DATA 6- 19 - 19 - 19 - 19 - 19 - 19 - 19 - 1	l	0	UNITED DATA CENTER	5- 8	6	+ 1/4	+2.3
N ADDRESSOGRAPH-MULT O ADVANCED MEMORY SYS 12-23 21 1/4 -1 3/8 -6.0 N AMPEX CORP O ANDERSON JACOBSON O BEEHIVE MEDICAL ELEC B BOLT-BERANCK & NEH O B 1/8 -1/4 -2.15 D C BEEHIVE MEDICAL ELEC B BOLT-BERANCK & NEH O B 1/8 -1/4 -2.16 D C CAMBRIDGE MEMORIES O C LATTON O CAMBRIDGE MEMORIES O C LATTON O COMPITEN LOTAL O COMPITEN LOTAL O COMPUTEN MACHINERY O COMPUTER COMMUN. D C COMPUTER COMMUN. D C COMPUTER TRANSCEIVER O COMPUTER TRANSCEIVER D C COMPUTER TRANSCEIVER D C COMPUTEN TARBOCCIVER O COMPUTEN O COMPUTEN TARBOCCIVER O COMPUTEN TARBOCCIVER O COMPUTEN TARBOCCIVER O COMPUTEN O COMPUTEN TARBOCCIVER O COMPUTEN O COMPUTE	l		URS SYSTEMS	6- 10	5 3/4		
N AMPEX CORP O ANDERSON JACOBSON A BEHIVE MEDICAL ELEC BEHIVE BOLD BOLD BEHIVE BO	l		ADDRESSOGRAPH-MULT	27- 49	27		
D   BEEHIVE MEDICAL ELEC   1- 8   6 7/8   -3/8   -5.1   A   BOLT, BERANEK & NEW   9- 14   9 1/8   -1/4   -2.2   N   BUNKER-RAMO   9- 14   9 1/8   -1/4   -2.6   N   CAMBRIDGE MEMORIES   9- 15   12 3/4   -1/4   -1.9   O   COMENTICON   COEX CORP   6- 28   23 1/4   +1/4   +1.0   O   COEX CORP   6- 25   17 1/4   -1/2   -2.8   O   O   O   O   O   O   O   O   O	l	N	AMPEX CORP	5- 15	5 3/4	- 1/4	-4.1
N BUNKER-RAMO  A CALCOMP O CAMBRIDGE MEMORIES O CANTRONICS DATA COMP O CAMBRIDGE MEMORIES O CONTRONICS DATA COMP O CODEX CORP O COSTRONICS O CONTRONICS O CONTRONICS O COMPUTER COMMUN. 1 - 7 3 3/8 + 1/4 - 1/4 - 1.9 O COMPUTER COMMUN. 1 - 7 3 3/8 + 1/8 + 3.8 COMPUTER COMMUN. 1 - 7 3 3/8 + 1/8 + 3.8 COMPUTER COMMUN. 1 - 7 3 3/8 + 1/8 + 3.8 COMPUTER TRANSCEIVER O COMPUTER TRANSCEIVER O COMPUTER TRANSCEIVER O CONTROLS O CONTROLS O CONTROLS O DATA RECOGNITION O DATA RECOGNITION O DATA TECHNOLOGY O DATA TECHNOLOGY O DATA RECOGNITION O DATA TECHNOLOGY O COMPUTER SYS O COMPUTER SYS O INFORMATION INTI INC O COMPUTER SYS O INFORMATION INTI INC O LECTRONICS O MANAGEMENT ASSIST O INFORMATION INTI INC O LECTRONICS O MANAGEMENT ASSIST O INFORMATION INTI INC O COMPUTER SYS O MANAGEMENT SYSIST O O DECOMPUTER SYS O MANAGEMENT SYSIST O O DECOMPUTER SYS O PRECISION INST. O DECOMPUTER SYSIS O SCAN DATA O COMPUTER SYSIS O SCAN DATA O COMPUTER SYSIS O SCAN DATA O COMPUTER SYSIS O BALTIMORE BUS FORMS S - 9 8 1 1/4 - 1/20.6 O PRECISION INST. O RECOGNITION O COMPUTER SYSIS O BALTIMORE BUS FORMS S - 9 8 - 1/41/60.6 O COMPUTER SYSIS O WILLEK NC O COMPUTER SYSIS O BALTIMORE BUS FORMS S - 9 8 - 1/41/60.6 O COMPUTER SYSIS O BALTIMORE BUS FORMS S - 9 8 - 1/41/60.6 O COMPUTER SYSIS O BALTIMORE BUS FORMS S - 9 8 - 1/41/60.6 O COMPUTER SYSIS O WILLEK NC O COMPUTER SYSIS O BALTIMORE BUS FORMS S - 9 8 - 1/41/60.6 O COMPUTER SYSIS O BALTIMORE BUS FORMS S - 9 8 - 1/41/60.6 O COMPUTER SYSIS O BALTIMORE BUS FORMS S - 9 8 - 1/41/60.6 O COMPUTER SYSIS O GRAPHIC CONTROLS O COMPUTER SYSIS O MILTEK INC O COMPUTER SYSIS O MILTEK INC O COMPUTER SYSIS O COMPUTER SYSIS O MILTEK INC O COMPUTER SYSIS O COMPUTER SYSIS O MILTEK INC O COMPUTER SYSIS O MILTEK INC O COMPUTER SYSIS O COMPUTE	l	0	BEEHIVE MEDICAL ELEC	1- 8	6 7/8	- 3/8	-5.1
O CAMBRIDGE MEMORIES O CENTRONICS DATA COMP O CODEX CORP O CORPETORICS O CORPORTORICS O COMPUTER COMPUN. 1 - 7 3 3/8		N	BUNKER-RAMO	9- 14	9 1/8	- 1/4	-2.6
O CODEX CORP O COGNITRONICS COMPUTER COMMUN. COMPUTER COMMUN. COMPUTER COMMUN. COMPUTER COMMUN. COMPUTER COMMUN. COMPUTER TACHSTER COMPUTER COMPUTER TACHSTER COMPUTER TACHSTER COMPUTER TACHSTER COMPUTER COMPUTER TACHSTER COMPUTER COMPUTE	l	0	CAMBRIDGE MEMORIES	9- 15	12 3/4	- 1/4	-1.9
O COMPUTER COMMUN. A COMPUTER EQUIPMENT C 4 2 1/2 - 1/8 -4.7  O COMPUTER TACHINERY COMPUTER TRANSCEIVER COMPUTER TRANSCEIVER COMPUTEST C	ı	0	CODEX CORP	6- 25	17 1/4	- 1/2	-2.8
O COMPUTEST		0	COMPUTER COMMUN.	1- 7	3 3/8	+ 1/8	+3.8
A COMPUTEST 3-9 3 3/4 - 1/4 -6.2 N CONRAC CORP 24-39 27 1/2 - 7/8 -3.0 DATA PRODUCTS CORP 3-7 4 0 0.0 DATA RECOGNITION 1-5 2 1/2 +1 1/4 +100.0 DATA TECHNOLOGY 2-5 3 7/8 + 1/4 +6.8  O DI/AN CONTROLS 0-8 3 7/8 - 1/8 -3.1 N ELECTRONIC M & M 3-8 4 5/8 - 1/8 -2.6 O FABRI-TEK 2-5 4 1/4 - 1/2 -10.5 O GENERAL COMPUTER SYS 6-16 7 3/4 + 3/4 +10.7 N GENERAL COMPUTER SYS 6-16 7 3/4 + 3/4 +10.7 N GENERAL COMPUTER SYS 6-16 7 3/4 + 3/4 +10.7 N GENERAL ELECTRIC 59-74 68 1/2 -3 3/8 -4.6 N HAZELTINE CORP 7-13 8 1/8 + 1/2 +6.5 O INFORMATION DISPLAYS 1-5 1 - 1/8 -11.1 O INFORMATION INTL INC 8-25 12 1/2 -1 -7.4 A LUNDY ELECTRONICS 8-14 8 3/4 + 1/4 +2.9 O MANAGEMENT ASSIST 1-1 1/4 -1/8 -33.3 A MILGO ELECTRONICS 15-44 21 -1 1/2 -6.6 N MOHAWK DATA SCI 9-27 9 7/8 - 3/4 -7.0 O DEC COMPUTER SYST. 6-12 4 3/4 0 0 0.0  O OPTICAL SCANNING 5-16 5 1/4 0 0.0 O PERTEC CORP 7-17 7 - 1/4 -3.4 O PHOTON 4-15 4 -1 5/8 -28.8 O PRECISION INST. 3-13 3 - 1/4 -7.6 O RECOGNITION EQUIP 5-15 6 1/4 -1 -13.7 N SANDERS ASSOCIATES 13-21 14 1/2 -7/8 -5.6  SCAN DATA 4-13 3 5/8 -3/8 -9.3 STORAGE TECHNOLOGY 17-39 28 -1 1/4 -4.2 O SYCOR INC 7-11 10 1/4 -1/2 +3.9 N TEKTRONIX INC 34-6 51 5/8 +5/8 +1.2 N TELEX 515 5 3/8 -1/2 -8.5 O WILTEK INC 10-26 14 -1 1/2 -9.6  BALTIMORE BUS FORMS 5-9 8 -1 1/4 -4.2 N TELEX 515 5 3/8 -1/2 -8.5 O WILTEK INC 10-26 14 -1 1/2 -9.6  BALTIMORE BUS FORMS 6-10 7 7/8 0 0.0 O GRAHAM MAGNETICS 15-27 7 3/4 -1 1/4 -6.5 O GRAPHIC CONTROLS 11-15 11 1/4 -1/4 -2.6 N ENNIS BUS. FORMS 6-10 7 7/8 0 0.0 O GRAHAM MAGNETICS 15-27 7 3/4 -1 1/4 -6.5 O GRAPHIC CONTROLS 11-15 11 1/4 -1/4 -2.2 N 3M COMPANY 76-88 86 3/4 + 1/8 +0.1 N MOORE CORP LTD 42-57 56 -1 -1.7 N NASHUA CORP 0 REYNOLD 37-7 47 5/8 + 1/8 +0.2				7- 13 2- 9			
A DATA PRODUCTS CORP O DATA RECOGNITION O DATA TECHNOLOGY D TO THE TIME TO THE TIME THAT THE		A	COMPUTEST	3- 9	3 3/4	- 1/4	-6.2
O DI/AN CONTROLS  N ELECTRONIC M & M  S				3- 7	4	0	0.0
N ELECTRONIC M & M 3-8 4 5/8 - 1/8 -2.6 O FABRI-TEK 2-5 4 1/4 - 1/2 -10.5 O GENERAL COMPUTER SYS 6-16 7 3/4 + 3/4 +10.7 N GENERAL CLECTRIC 59-74 68 1/2 -3 3/8 -4.6 N HAZELTINE CORP 7-13 8 1/8 + 1/2 +6.5 O INFORMATION DISPLAYS 1-5 1 - 1/8 -11.1 O INFORMATION INTL INC 8-25 12 1/2 -1 -7.4 A LUNDY ELECTRONICS 8-14 8 3/4 + 1/4 +2.9 O MANAGEMENT ASSIST 1-1 1/4 -1/8 -33.3 A MILGO ELECTRONICS 15-44 21 -1 1/2 -6.6 N MOHAWK DATA SCI 9-27 9 7/8 - 3/4 -7.0 O DDEC COMPUTER SYST. 6-12 4 3/4 0 0 0.0 O DEC COMPUTER SYST. 6-12 4 3/4 0 0 0.0 O DEC COMPUTER SYST. 6-12 4 3/4 0 0 0.0 O PRECISION INST. 3-13 3 -1/4 -7.6 O SCAN DATA 4-13 35/8 -3/8 -9.3 O STORAGE TECHNOLOGY 17-39 28 -1/4 -4.2 O SYCOR INC 7-11 10 1/4 -1/2 -4.6 O TALLY CORP. 8-15 13 1/4 + 1/2 +3.9 N TEKTRONIX INC 34-64 51 5/8 +5/8 +1.2 N TELEX 515 5 3/8 -1/2 -8.5 O MILTEK INC 10-26 14 -1 1/2 -9.6 O GRAPHIC COMPONIS 17-26 13/8 +3/8 +1.7 O DUPLEX PRODUCTS INC 8-16 9 1/4 -1/4 -2.6 N ENINS BUS. FORMS 6-10 7/8 0 0.0 O O O O O O O O O O O O O O O O O							
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N HAZELTINE CORP 7- 13 8 1/8 + 1/2 +6.5  O INFORMATION DISPLAYS 1- 5 1 - 1/8 -11.1  O INFORMATION INTL INC 8- 25 12 1/2 -1 -7.4  A LUNDY ELECTRONICS 8- 14 8 3/4 + 1/4 +2.9  O MANAGEMENT ASSIST 1- 1 1/4 -1/8 -33.3  MILGO ELECTRONICS 15- 44 21 -1 1/2 -6.6  N MOHAMK DATA SCI 9- 27 9 7/8 - 3/4 -7.0  O ODEC COMPUTER SYST. 6- 12 4 3/4 0 0 0.0  O PETICAL SCANNING 5- 16 5 1/4 0 0.0  O PERTEC CORP 7- 17 7 - 1/4 -3.4  O PHOTON 4- 15 4 -1 5/8 -28.8  A POTTER INSTRUMENT 7- 21 7 5/8 0 0.0  O PRECISION INST. 3- 13 3 -1/4 -7.6  O RECOGNITION EQUIP 5- 15 6 1/4 -1 -13.7  N SANDERS ASSOCIATES 13- 21 14 1/2 - 7/8 -5.6  O SCAN DATA 4- 13 3 5/8 - 3/8 -9.3  O STORAGE TECHNOLOGY 17- 39 28 -1 1/4 -4.2  O SYCOR INC 7- 11 10 1/4 - 1/2 -4.6  O TALLY CORP. 8- 15 13 1/4 + 1/2 -3.9  N TEKTRONIX INC 34- 64 51 5/8 +5/8 +1.2  N TELEX 515 5 3/8 -1/2 -8.5  O MILTEK INC 10- 26 14 -1 1/2 -9.6  SUPPLIES & ACCESSORIES  O BALTIMORE BUS FORMS 5- 9 8 + 1/2 -8.5  O MILTEK PRODUCTS INC 8- 16 9 1/4 - 1/4 -2.6  N ENNIS BUS. FORMS 6- 10 7 7/8 0 0.0  O GRAPHIC CONTROLS 11- 15 11 1/4 - 1/4 -2.1  N 3M COMPANY 76- 88 86 3/4 + 1/8 +0.1  N MOORE CORP LTD 42-57 56 -1 -1.7  N MASHUA CORP 0 REYNOLD 37-77 47 5/8 + 1/8 +0.2		N	GENERAL ELECTRIC	59- 74	7 3/4	+ 3/4	
O INFORMATION INTL INC A LUNDY ELECTRONICS B- 14 8 3/4 + 1/4 +2.9 O MANAGEMENT ASSIST I- 1 1/4 -1/8 -33.3 A MILGO ELECTRONICS N MOHAMK DATA SCI O DDEC COMPUTER SYST. CODEC COMPUTER STATEMET. CODEC C			HAZELTINE CORP	7- 13	8 1/8	+ 1/2 -1 7/8	
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O STORAGE TECHNOLOGY 17- 39 28 -1 1/4 -4.2 O SYCOR INC 7- 11 10 1/4 - 1/2 -4.6 O TALLY CORP. 8- 15 13 1/4 + 1/2 +3.9 N TEKTRONIX INC 34- 64 51 5/8 + 5/8 +1.2 N TELEX 515 5 3/8 - 1/2 -8.5 O WILTEK INC 10- 26 14 -1 1/2 -9.6  SUPPLIES & ACCESSORIES O BALTIMORE BUS FORMS 5- 9 8 + 1/2 +6.6 A BARRY WRIGHT 9- 14 10 1/8 -1 3/8 -11.9 DUPLEX PRODUCTS INC 8- 16 9 1/4 - 1/4 -2.6 N ENNIS BUS. FORMS 6- 10 7 7/8 0 0.0 GRAHAM MAGNETICS 15- 27 17 3/4 -1 1/4 -6.5 O GRAPHIC CONTROLS 11- 15 11 1/4 - 1/4 -2.1 N 3M COMPANY 76- 88 86 3/4 + 1/8 +0.1 O MOORE CORP LTD 42- 57 56 -1 -1.7 N NASHUA CORP 48- 62 55 3/4 + 5/8 +1.1 O REYNOLOS & REYNOLD 37- 77 47 5/8 + 1/8 +0.2			SANDERS ASSOCIATES	5- 15 13- 21			
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N TELEX O WILTEK INC  0 WILTEK INC  10 - 26 14  SUPPLIES & ACCESSORIES  0 BALTIMORE BUS FORMS A BARRY WRIGHT A DATA DOCUMENTS DUPLEX PRODUCTS INC NENNIS BUS. FORMS A BANGETICS C GRAPHIC CONTROLS  1 - 26 21 3/8 + 3/8 + 11.7  0 0.00  1 - 1/4 - 2.6  N ENNIS BUS. FORMS A B - 10 7 7/8 0 0.0  O GRAHAM MAGNETICS C GRAPHIC CONTROLS  11 - 15 11 1/4 - 1/4 - 2.1  N 3M COMPANY MOORE CORP LTD N MASHUA CORP HORE NO REYNOLDS & REYNOLD  17 - 77 47 5/8 + 1/8 + 0.2			TALLY CORP.	8- 15	10 1/4 13 1/4	- 1/2 + 1/2	
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O GRAHAM MAGNETICS 15- 27 17 3/4 -1 1/4 -6.5 O GRAPHIC CONTROLS 11- 15 11 1/4 - 1/4 -2.1   N 3M COMPANY 76- 88 86 3/4 + 1/8 +0.1 O MOORE CORP LTD 42- 57 56 -1 -1.7 N ASHUA CORP 48- 62 55 3/4 + 5/8 +1.1 O REYNOLDS & REYNOLD 37- 77 47 5/8 + 1/8 +0.2		0	DUPLEX PRODUCTS INC	8- 16	9 1/4	- 1/4	-2.6
N 3M COMPANY 76-88 86 3/4 + 1/8 +0.1 O MOORE CORP LTD 42-57 56 -1 -1.7 N NASHUA CORP 48-62 55 3/4 + 5/8 +1.1 O REYNOLDS & REYNOLD 37-77 47 5/8 + 1/8 +0.2		0	GRAHAM MAGNETICS	15- 27	17 3/4	-1 1/4	-6.5
N NASHUA CORP 48- 62 55 3/4 + 5/8 +1.1 D REYNOLDS & REYNOLD 37- 77 47 5/8 + 1/8 +0.2		N	3M COMPANY	76- 88	86 3/4	+ 1/8	+0.1
		N	NASHUA CORP	48- 62	55 3/4	+ 5/8	+1.1

AY,	JANUARY 24, 1973							
E					PRI	CE		
X		19	72	C	LOSE	W	EEK	WEEL
C		RAN	GE	JA	N 25		NET	PC
Н		(1	1	-	1973	CHI	NGE	CHNG
0	TAR DRODUCTS CO	16.	23	21		-	3/4	-3-4
U	TAB PRODUCTS CO	21	2.5	20	1/2	- 1	314	-4
N	WARCO WABASH MAGNETICS	21-	28	20	1/2	-1		-4.1
A	WABASH MAGNETICS	6-	11	6	1/8	+	1/8	+1.0
N	TAB PRODUCTS CO UARCO WABASH MAGNETICS WALLACE BUS FORMS	21-	26	25			1/2	-1.
	COM	PUTER	SYS	TEMS				
N	BURROUGHS CORP COLLINS RADIO CONTROL DATA CORP DATA GENERAL CORP DIGITAL COMP CONTROL DIGITAL EQUIPMENT ELECTRONIC ASSOC.	147-	230	220	5/8	-7	3/8	-3.
9.1	COLLINS PADIO	14-	27	21	3/4	-	1/4	-1.1
81	COLETING RADIO	4.2	70	EE	3 / 4	- 9	1/0	-1 6
N	CUNTRUL DATA CURP	45-	10	22	1/4	-1	1/0	-1.
0	DATA GENERAL CURP	56-	130	121		-6	1/2	-5.0
0	DIGITAL COMP CONTROL	5-	25	5	1/4	-	1/4	-4.
N	DIGITAL EQUIPMENT	72-1	101	96	1/2	-1	7/8	-1.9
N	ELECTRONIC ASSOC.	6-	13	8	1/8	-	7/8	-9.
	ELECTRONIC ENGINEER. FOXBORD GENERAL AUTOMATION GRI COMPUTER CORP HEWLETT-PACKARD CO HONEYWELL INC 18M	4-	16		1/2	_	1/0	-1
A	ELECTRONIC ENGINEER.	22	4.3	30	1/2	-	1/0	10
N	FUXBURU	23-	41	50	1/8	-	1/8	-0.2
0	GENERAL AUTOMATION	13-	49	46	3/4	+	1/4	+0.
0	GRI COMPUTER CORP	2-	5	2	1/2	+	1/8	+5.2
N	HEWLETT-PACKARD CO	46-	94	90	3/8	+	3/8	+0.4
84	HONEYWELL INC	118-1	70	128	3/4	-4	3/4	-3.6
N	IBM	333-	444	436	314	+7	1/8	+1.0
0	INTERDATA INC	8-	16	11	5/8	+	1/4	+2.
N	MEMOREX	15-	38	16	3/4	- com	5/8	-3.5
n	MICRODATA CORP	5-	10	9	3/8	-	1/2	-5-6
N	NC D	20-	3.8	20	1/2	-1	7 /8	-5.0
LA	NCK	27-	30	27	116	-7	0//	-200
N	RAYTHEUN CU	21-	41	30	1/4	-1	3/4	-5.4
N	SPERRY RAND	30-	50	47	3/4	-	1/2	-1.0
Δ	INTERDATA INC MEMOREX MICRODATA CORP NCR RAYTHEON CO SPERRY RAND SYSTEMS ENG. LABS	7-	16	7	1/4	-	3/8	-4.9
	VARIAN ASSOCIATES WANG LABS. XEROX CORP							
N	WANG LABS.	23-	61	29	1/2	-	1/4	-0.8
N	XEROX CORP	121-1	172	152	1/2	+	7/8	+0.5
	LEAS	ING CO	3M P A	NIES				
-				-				
A	ROOTHE COMPOTER	3-	18	3	2 (0	(	2 10	0.0
0	BRESNAHAN COMP.	1-	3	1	3/8	coin	1/8	-8.3
0	COMDISCO INC	3-	18	15	5/8	-1		-6.0
0	COMMERCE GROUP CORP	5-	11	5	3/8	ann	1/8	-2.2
n	COMPLITER EXCHANGE	1-	3		5/8	(	)	0.0
A	COMPUTED INVETOS COD	6-	34	6	3/8	-	7 /9	-12.0
0	COMP. INSTALLATIONS	2-	5	2	3,0	(	)	0.0
	BODTHE COMPUTER BRESNAHAN COMP. COMDISCO INC COMMERCE GROUP CORP COMPUTER EXCHANGE COMPUTER INVSTRS GRP COMP. INSTALLATIONS  DPF INC DATRONIC RENTAL DCL INC DEARBORN-STORM DPA, INC. GRANITE MGT GREYHOUND COMPUTER		1.2		1.72		E / O	-7 -
N	UPP INC	5-	13	-	1/2	-	2/8	-1.6
M	DATRUNIC RENTAL	2-	4	5	1/4	-	1/8	-5.2
Α	DCL INC	2-	10	2	5/8	(	)	0.0
A	DEARBORN-STORM	16-	26	22	1/2	-	3/4	-3.2
Δ	DPA. INC.	5-	8	6	7/8	-	3/8	-5.1
A	CDANITE MCT	5	11	6	5 /8	-	1 /8	-2.1
A	GUARTIE HOI	5-	11	9	510	_	110	- 6 . 1
Α	ITEL LEASCO CORP LEASPAC CORP LECTRO MGT INC ROCKWOOD COMPUTER SYSTEMS CAPITAL U.S. LEASING	7-	12	11	1/8	0	)	0.0
N	LEASCO CORP	15-	24	14	3/4	-	5/8	-4.0
0	LEASPAC CORP	6m	15	6	3/4	-	1/2	-6.8
0	LECTRO MCT THE	1	1	3	7/0	_	1/0	-4 3
U	LECTRO MGT INC	1-	4	1	1/8	-	1/8	-0.2
A	ROCKWOOD COMPUTER	2-	7	2	3/8	-	1/8	-5.0
0	SYSTEMS CAPITAL	3-	20	11	1/8	-1		-8.2
N	U.S. LEASING	19-	35	32	1/2	-1	5/8	-4.7
EXC	CH: N=NEW YORK EXCHANGE L=NATIONAL EXCHANGE P=PHIL-BALT-WASH I-C PRICES ARE BID PRICES	E; A=A E; O=O	MER: VER-	ICAN THE-	EXCHA	NGE		

O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID (1) TO NEAREST DOLLAR

# **Computer Stocks Trading Index**

	Computer Sys	tems	 Sof			)P
*******	Peripherals &	Subsytems	 Las	Serv	Comp	niec
	Supplies & Ac					



# **Earnings** Reports

APPLIED MAGNETICS

	at miraga palat	
	1972	1971
hr Ernd	\$.26	\$.33
Revenue	31,764,695	24,030,566
Spec Chg	425,000	92,691
Earnings	1,090,811	1,351,191
-In 1972.	provision for p	otential loss
n disposi	tion of food	processing
lant; 'in	1971 from s	ale of sub-

#### SEISMIC COMPUTING Year Ended Sept. 30

	1972	1971
Shr Ernd	\$1.13	\$.75
Revenue	25,784,000	22,059,000
a Spec Cred	378,000	38,000
Earnings	1,411,000	893,000
	from sale of subordinated	
	from purcha	
ordinated de	ebentures.	

# DATA DESIGN LABORATORIES Three Months Ended Sept. 30

	1972	a1971
Shr Ernd	\$.10	\$.10
Revenue	2,235,509	1,840,178
Tax Cred	10,350	16,750
Earnings	112,527	114,047
a-Restated.		

# ELECTRONIC COMPUTER PROGRAMMING INSTITUTE Three Months Ended Sept. 30

111100 111	Onthis Ended 3	opt. 50
	1972	1971
Shr Ernd	\$.01	\$.02
Revenue	1,047,964	765,128
Spec Cred		a3,400
Earnings	3,568	15,789
9 Mo Shr	.01	
Revenue	3,093,131	2,191,773
Spec Chg		b18,506
Earnings	4,129	(11,402)
	ment from the Loss from subsidiary.	six-month sale of

## COMPUTER COMMUNICATIONS Three Months Ended Sept. 30

	1972	a1971
Shr Ernd	\$.06	
Revenue	1,600,511	\$748,188
Disc Op		(121,513)
Tax Cred	50,000	
Earnings	100,821	(627, 589)
-Restated		

# INFORMATION INTERNATIONAL

317 141	Oliffing Clided	OCI. 01
	1972	1971
Shr Ernd	\$.15	
Revenue	3,491,189	\$1,297,928
Tax Cred	176,000	
Earnings	380,488	(195, 171)

#### AMPEX Three Months Ended Oct. 28

iniee	Mouths Fudeo	OCT. 28			
	1972	a19	71	i	
Shr Ernd	\$.02				
Revenue	78,040,000				
Earnings	271,000				
6 Mo Rev	146,849,000				
Loss	2,894,000				

a-Comparative figures not available.

# BOOTHE COMPUTER Three Months Ended Sept. 30 1972 1971

	19/2	19/1
Shr Ernd		a\$.32
Revenue	\$12,718,000	14,998,000
Disc Op		(193,000)
Earnings	(13,572,000)	680,000
9 Mo Shr		a1.17
Revenue	40,714,000	45,576,000
Disc Op		(431,000)
Spec Cred	b1,148,000	
Earnings	(12,334,000)	2,475,000
	for a 10% sto 72. b-From sale s.	

CALIFORNIA COMPUTER
PRODUCTS
Three Months Ended Oct. 1

	1972	a1971
Revenue	\$12,992,000	\$13,483,000
Spec Chg		b4,725,000
Loss	2,283,000	4,953,000
	to conform	
	policies.	
	orior years of	
	nethod of ac	
	and develo	
and lease	acquisition an	d installation
costs.		

## INFORMATION DISPLAY Nine Months Ended Sept. 30

ı	1	1972	1971
ı	Revenue	\$1,377,651	\$1,129,799
ı	Revenue Loss	208,182	160,624

#### COMPUTER TAPE RECERTIFICATION

We make your old tapes like new again—at ½ the cost of new tape. Six locations, Fast mail service.

# ISC/PRYOR COMPUTER

# Extend your 360 or 370 WITH EDOS, The Extended DOS AND EDOS Extended Spooling

#### EDOS is ...

- Improved Throughput of 50%
- **■** Compatible with DOS
- **■** Continuing Support

With Basic EDOS, users throughout the world have been experiencing overall 25% improvement in systems throughput. The Extended Spooling Facility has more than doubled this remarkable performance improvement, with users reporting improvements of as much as 75% in systems throughput. In addition, the Six Partition Support feature doubles partition availability.

EDOS is 100% compatible with DOS. All IBM distributed programs and all user written programs operate without modification.

On March 31, 1973, IBM will no longer provide free DOS/360 maintenance. EDOS users will continue to receive without charge complete maintenance. Continuing support not only in terms of maintenance, but a continuous development plan of powerful extensions.

#### EDOS is ...

**■** Integrated Features

Automatic Volume Sensing—tape and disk assignments by device type at execute time.

Relocation—catalogue any program once and execute in any partition.

**Procedure Library**—an 'intelligent' procedure library, permitting selective retrieval of catalogued job control.

Job Accounting—a complete data collection, summarization and reporting system.

Text Editor—for documentation of your programs.

**Extended Source Library**—extends the source library support to all languages down to the statement level.

Load Balancing—automatic optimization of C.P.U. utilization.

Resident Transients—saves up to 50% of program execution time and is especially useful with ISAM

Fast Dump/Restore—dump a 2314 volume to tape in five minutes and restore in four minutes.

Fast Linkage Editor—twice as fast as the standard linkage editor.

**Blocked Fetch**—a transparent feature providing improved C.P.U. performance.

Modified Storage Dump—saves 40% of storage dump time.

THESE TWELVE FEATURES CONSISTENTLY PROVIDE OVERALL THROUGHPUT IMPROVEMENTS OF 25%.

Six Partition SupportExtended Spooling

Twice the partition availability—it's like having another C.P.U. Run whatever you want in any partition.

A new and unique high performance spooling system integrated into EDOS.

Performance—up to 50% improved throughput performance over any other spooling system available.

Dynamic Core Allocation—The only resident core that is required is 2K in the EDOS Supervisor.

All additional modules (approximately 2K per device) are resident only during the time of actual use.

Compare this with other spooling systems that require resident core for all real and pseudo devices at all times.

Minimum Disk Requirements—requires one half of the disk space required by other spooling systems.

Operator Ease/Flexibility—The Computer Company did more than just incorporate all of the features found in other spooling systems. We implemented a complete operator oriented system designed primarily for ease of use with maximum flexibility.

#### EDOS is ...

#### Unquestionably the best software value on the market today!

EDOS was developed by The Computer Company to improve the performance and operational characteristics of the IBM Disk Operating System (DOS) on your System/360 or System/370. EDOS is the new support for the DOS user. EDOS is a continuing series of system releases offering coordinated enhancements to DOS. The performance and features of EDOS make it a logical alternative to OS without conversion.

EDOS is inexpensive. With all of the features and performance that EDOS provides, its compatibility and ease of installation, you will want to evaluate it in your own installation. We frankly believe you will agree that EDOS is the most exciting systems software available. A 60 day free evaluation period is provided.

The Basic System Release 5 of EDOS (all features except Six Partition Support and Extended Spooling) has a lease price of \$225.00 per month. Six Partition Support has a monthly lease price of \$75.00; Extended Spooling has a monthly lease price of \$200.00.

MARKETING AGENTS FOR EDOS



COMPUTER PRODUCTS, INC.

a subsidiary of Group COMPUTER INVESTORS GROUP, INC.

ADDRESS \_\_\_\_\_\_STATE \_\_\_ZIP\_\_

